The Integration of International Supply Chain Management and E-business

by

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Submitted to the System Design and Management Program
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ABSTRACT

Internet technology has changed this world rapidly in the past decade. The influence of E-business on the economy and business practice has been tremendous. The focus of many companies has been on improving the extended enterprise transactions including Business-to Customer (B2C) and Business-to-Business (B2B). Facing this shift in corporate focus, more and more companies realize the importance of supply chain management in the global E-business environment. The purpose of this thesis is to understand the relationship between supply chain management and E-business, especially from international point of view. The analysis started from the review of supply chain management and E-business, further continued on the strategic impact of E-business on supply chain management and discussed the associate issues during the integration of E-business and supply chain. Finally, some future opportunities will be introduced to illustrate new developments in the E-supply chain environment, especially for small business.

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DEDICATION

This thesis is dedicated to my family, who offered me unconditional love and support throughout my study at MIT.

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First of all, I would like to thank Professor Henry Marcus, who continuously gave me invaluable guidance and encouragement throughout my study at MIT. I would also like to thank the Director of SDM program, Mr. Pat Hale, who was always supportive and shared his knowledge with me in developing this thesis. Despite their already tight schedule, they were always willing to review my less focused drafts and provide constructive comments. I would never forget their warmth and kindness.

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Finally, I would like to dedicate this thesis to the unforgettable memory of my grandfather, Zhongjiang Xiao, for his guidance and his belief in me.

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Chapter 1: Introduction

This chapter introduces and defines some principal terms that will be used throughout the entire research. This chapter also tries to justify the importance of this research topic. Finally, the chapter gives an overview of this research's architecture.

1.1 The Rise of Internet

Driven by the need to share more information, the Internet has developed into world's largest and most widely used network. The Internet is an international collection of hundreds and thousands of private and public computer networks. It represents a global platform that allows digital information to be shared and distributed to different users. The Internet has a very broad range of information sharing functions, such as accessing information (e.g., reading online electronic documents), supplying information (e.g., publishing news online), and communication (e.g., sending emails).

It is no wonder that people with a business mind quickly noticed the opportunities to conduct business by using the Internet. The universality that the Internet can offer has enabled by businesses to accept standards which allow storing, retrieving, formatting, and displaying information in a networked environment. This environment of the Internet is called the World Wide Web (WWW). It allows businesses to get online and conduct different kinds of business activities. One typical example of that use of WWW is the advent of Websites for conducting

business transactions. The capacity of WWW also allows users to search, locate and view multimedia documents (such as, pictures, text, videos) that compose Websites. During the 1990's, the use of the WWW matured and some new terms also emerged to describe the business transactions that happen on the Internet. "Electronic Business" was one of these new terms. Often it also referred as "E-business".

1.2 What Is E-business?

One of the first to use the term E-business was IBM in 1997. At that time, they launched their first thematic campaign built around the term. Until then, E-commerce was the buzzword used. The shift in terms also means a shift in paradigm. Until then, selling was the only experience that people could reproduce on the web. Broadening the approach to allow more types of business transactions on the web created the new term e-business. E-commerce is just one aspect of e-business like e-franchising, e-marketing. E-business is about using the convenience, availability and world-wide reach to enhance existing business or creating new virtual business. IBM defines E-business as "a secure, flexible and integrated approach to delivering differentiated business value by combing the systems and processes that run core business operations with the simplicity and reach made possible by Internet Technology." This encompasses all activities supporting market transactions including marketing, customer support, delivery and payment. The term "brick-and-mortar" business is often used to describe traditional or regular business.

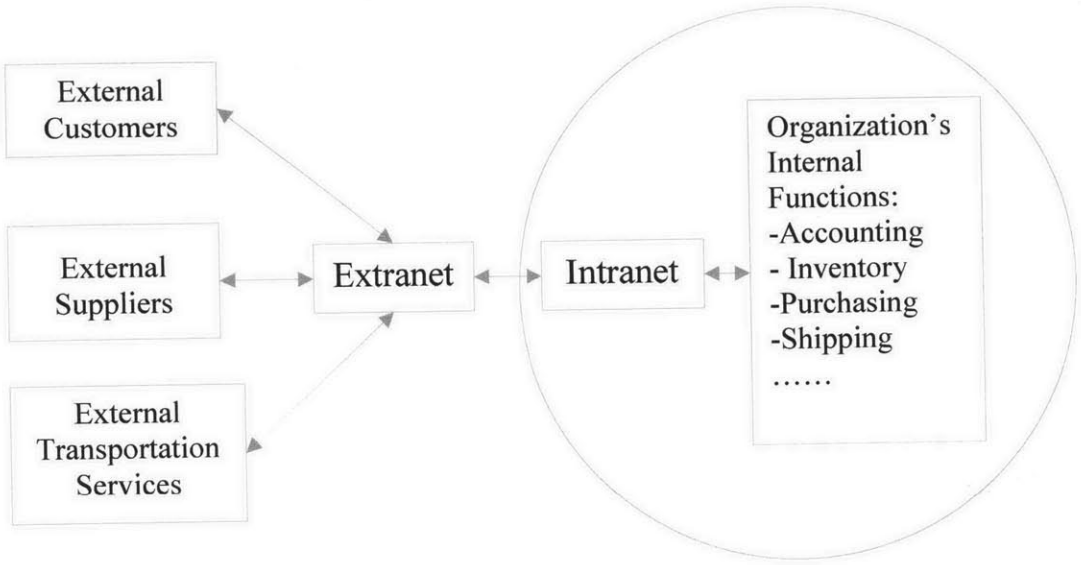

Figure 1-1 Intranet and Extranet

(Source - Internet Business Models and Strategies: Text and Cases, 2001)

Basically E-business is what happens when a company combines the resources of traditional information systems with the vast reach of the Web and connects critical business systems directly to critical business constituencies-customers, employees and suppliers via Intranets, Extranets and the Web. What is the difference between Intranet and Extranet? The Intranet is the network within a company and represented by the circled area in Figure 1-1. The Extranet is the network that uses the Internet to link intranets with select business partners, such as external suppliers, external transportation services and external customers as shown in Figure 1-1. Therefore, by connecting the company's traditional IT systems to the Web the company's business becomes an E-business. Most companies deploy applications on the Internet making it easier to do the things you already do.

In order to differentiate E-business, there is one term, E-commerce, which is often mentioned with E-business. However, it strictly refers to the process of performing transactions utilizing the Internet, such as placing and receiving orders over the Web, or other application which provide visibility to the entire supply chain. Therefore, E-commerce is only a component of E-business.

1.3 What Is Supply Chain Management?

Competition and globalization are changing the practice of traditional logistics strategy. A successful logistics strategy has moved from an internal focus emphasizing integration with other enterprise functions (e.g. marketing and operations) and linking the various enterprise functions to the overall corporate strategy, to an external focus of integrating supply-chains and cycle time compression, that is, the complete scope of supply chain management.

In a typical supply chain (Figure 1-2), physical materials or products flow from up-stream to down-stream (e.g., raw materials from suppliers to manufacturers, product from manufacturers to wholesalers, wholesalers to retailers, and retailers to customers) while the information flows from down-stream to up-stream along the supply chain. The process of managing these supply systems is called supply chain management (SCM).

As Figure 1-2 shows, a typical supply chain can have multiple tiers of suppliers and vendors as well as multiple levels of distribution channels before the product reaches the end customer. Within the framework of a single supply chain, it is not uncommon to have up to 1,000 second-tier suppliers or some third-tier suppliers.

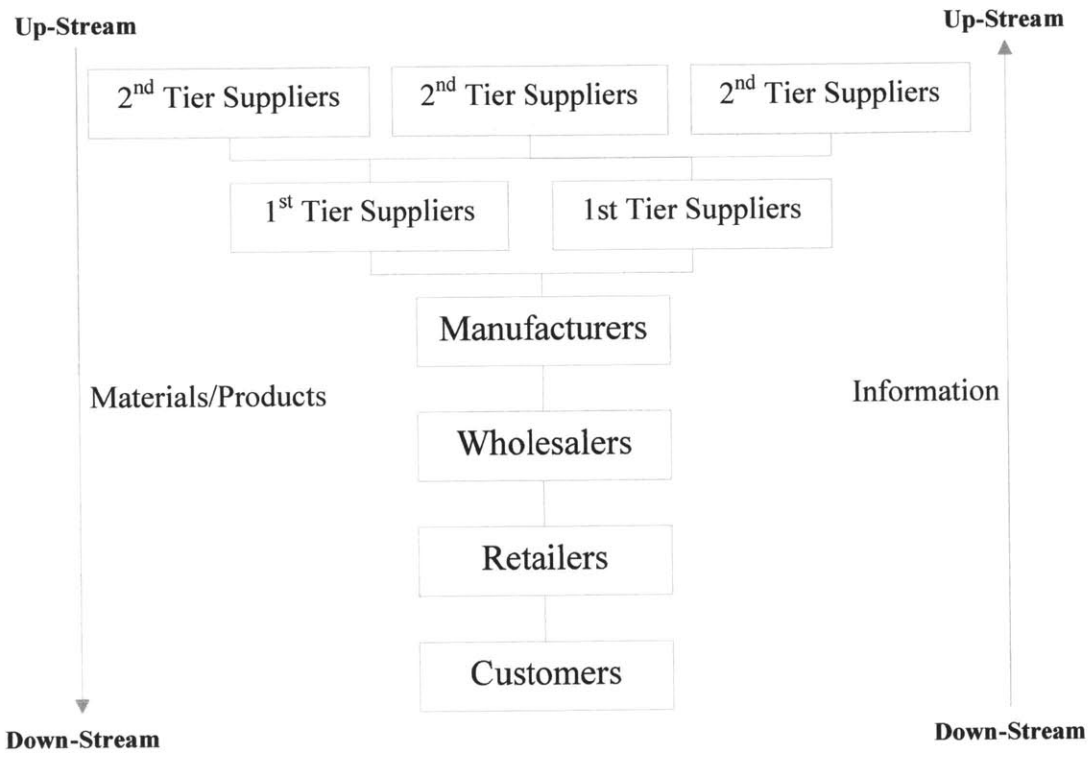

Figure 1-2 Typical Supply Chain

(Source: E-Commerce Operation Management, Schniederjans and Cao, 2002)

In addition, according to the Council of Supply Chain Management Professionals (CSCMP), a professional association that developed a definition in 2004, Supply Chain Management "encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers. In essence, Supply Chain Management integrates supply and demand management within and across companies."

1.4 What is International Supply Chain Management (ISCM)?

With increased globalization and offshore sourcing, international (or global) supply chain management (ISCM) is becoming an important issue for many businesses. Like traditional supply chain management, the underlying factors behind the trend are reducing the costs of procurement and decreasing the risks related to purchasing activities. The big difference is that international supply chain management involves a company's worldwide interests and suppliers rather than simply a local or national orientation.

Because international supply chain management usually involves numerous countries, it usually comes with new difficulties that need to be dealt with appropriately. One key thing that companies need to consider is the overall costs. While local labor costs may be significantly lower, companies must also focus on the costs of space, tariffs, and other expenses related to doing business overseas. Additionally, companies need to factor in the exchange rate. Obviously, companies must do their research and give serious consideration to all of these different elements as part of their international supply management approach.

Time is another big issue that should be addressed when dealing with international supply chain management. The productivity of the overseas employees and the extended in-transit time can either positively or negatively affect the company's lead time, but either way these times need to be figured into the overall procurement plan. Other factors can also come into play here as well. For example, the weather conditions on one side of the world often vary greatly from those on the other and can impact material, production, warehousing and

shipping dramatically. Also, customs clearance time and other governmental red tape can add further delays that need to be planned for and figured into the big picture.

Besides these issues, a business attempting to manage its international supply chain must also ask itself a number of other serious questions. First, the company needs to make decisions about its overall outsourcing plan. For whatever reason, businesses may desire to keep some aspects of supply chain closer to home. However, these reasons are not quite as important as other countries advance technologically. For example, some parts of India have now become centers for high-tech outsourced services which may once have been done in-house out of necessity. Not only are these services provided to companies by highly qualified, overseas workers, but they are being done at a fraction of the price they could be done in the United States or any other Western country.

Another issue that must be incorporated into an international supply chain management strategy is supplier selection. Comparing vendor bids from within the company's parent-country can be difficult enough but comparing bids from an array of global suppliers can be even more complex. How to make these choices is one of the first decisions companies must make, and it should be a decision firmly based on research. Too often companies jump on the lowest price instead of taking the time to factor in all of the other elements, including those related to money and time which were discussed above. In addition, companies must make decisions about the number of suppliers to use. Fewer suppliers may be easier to manage but could also lead to potential problems if one vendor is unable to deliver as expected or if one vendor tries to leverage its supply power to obtain price concessions.

Finally, companies who choose to move their manufacturing overseas may have to face some additional considerations as well. Questions regarding the number of plants that are needed, as well as the locations for those plants can pose difficult logistical problems for companies. However, it often helps to examine these issues in terms of the international supply chain. For example, if a business uses a number of vendors around Bangalore, India, then it may make sense to locate the manufacturing plant that would utilize those supplies in or around Bangalore as well. Not only will this provide lower employee costs, but overall shipping and tariff expenses should also be reduced. This would then save the company money.

1.5 Why Study the Integration of ISCM and E-business?

The introduction of the Internet into activities performed by supply chain managers required change in virtually everything a supply chain manager is asked to do. Even if a firm chose not to use any of the e-business models, they must interact with firms that do. Hence understanding the relationship between E-business and supply chain management is not a free choice decision, but a requirement of supply chain managers who want to be successful in the modern business world.

For those companies which are actively involved in doing E-business, it is crucial to effectively deal with the supply chain management, especially from international perspective. There are several reasons as following:

First, E-business represents the real image of the free market and free traders all over the world. It means access to larger markets, mobility, and flexibility to employ workers and

manufacture products anywhere in the world by using the Internet technology. The potential future for global E-business is inevitable, even though constraints still exist due to language barriers, local government regulations, and access limitations.

Second, today's CEOs cannot just simply focus on the performance of the traditional supply chain. With the development of internet and global sourcing, the supply chain has been already extended internationally. The battleground has not been restricted in a single country. The emphasis of competition has also been moved on continuous improvement across the global supply chain.

Finally, in most industries today, it is not enough to simply optimize internal structures and infrastructures based upon business strategy. The most successful companies are those that have carefully linked their internal processes to external suppliers and customers in global supply chain. Therefore, how integrated e-business organizations are, with both international suppliers and customers, to reduce organizational boundaries and increase international supply chain efficiency become much more important than before.

1.6 How This Thesis is Organized?

The purpose of this thesis is to understand the relationship between supply chain management and E-business, especially from international point of view. This study will be preceded in the following chapters:

Chapter 2 presents the history and evolutions of supply chain management. Chapter 3 attempts a description the revolution of the Internet-driven E-business. Chapter 4 describes strategic impact of E-business on global supply chain management. Chapter 5 further discusses the issues and principles during integration of E-business and international supply chain. Chapter 6 gives a discussion about future opportunities for E-supply chain. Finally, Chapter 7 summaries the information and discussion presented in the previous chapters about the integration of E-business and supply chain management under international perspective.

Chapter 2: The Rise and Evolution of Supply Chain Management

Over the past decade, companies spanning a wide spectrum of industries have been focusing their competitive strategies on leveraging the competencies and innovative capabilities to be found in the clusters of customers and suppliers constituting their business supply chains. While it is true that during the same period much effort has been invested in quality management models, the application of information technologies, and process and organizational reengineering, today's best enterprises have increasingly looked toward supply chain management (SCM) to provide fresh vistas for new sources of competitive advantage.

In fact, the ultimate core competency an enterprise may possess today is not to be found in a temporary advantage it may hold, for example, in an area of product design or market brand, but rather in the ability to continuously assemble and implement market-wining capabilities arising from collaborative alliance with supply chain partners. Competitive advantage in tomorrow's environment will go to those enterprises that can consistently anticipate and implement customer-wining supply chain competencies, while discarding those that have commodities or can be easily copied by the competition.

This chapter begins with an examination of why SCM has risen to be perhaps today's most critical business strategic paradigm. Then, a short description of the evolution of Internet-enabled SCM will be explored.

2.1 The Rise of Supply Chain Management

In today's business environment, no enterprise can expect to build a successful product, process, or service advantage without integrating their strategies with those of the supply chain systems in which they are inextricably entwined. In the past, what occurred outside of the four walls of the business was of secondary importance in comparison to the execution of strategies designed to effectively manage internal engineering, manufacturing, marketing, sales, and finance activities. In contrast, a company's ability to look outward to its channel alliances to gain access to sources of unique competencies, physical resources, and marketplace value is now the measure of success. On modern business management, creating "chains" of business partners has become one of a successful company's most powerful competitive strategies.

The supply chain focus of today's enterprise has arisen in response to several critical business requirements. To begin with, companies have begun to extend the tools of modern enterprise management to their supplier and customer channels in the search for additional sources of cost reduction and process improvement. Over the past decade, businesses have been assiduously applying to internal functions computerized techniques and management methods, such as Enterprise Resource Planning (ERP), Total Quality Management (TQM), and Business Process Reengineering (BRP), in an effort to optimize organizations and activate highly agile, lean manufacturing and distribution functions capable of superlative quality an service. As this movement toward internal cost reduction and process optimization has moved to its ultimate conclusion, today's best companies have sought to apply the same management and technology paradigms outward to their supply chains. The goal is to

relentlessly eradicate all forms of waste where supply chain entities touch, such as logistics, inventory, procurement, customer management, product development, and financial functions.

Second, over the past several years, companies have all but abandoned strategies based on the vertical integration of resources. On the one side, businesses have continued to divest themselves of functions that were either not profitable or for which they had weak competencies. On the other side, today's market-leading enterprises have found that by closely collaborating with their supply chain partners in developing such cross-channel functions as product development, forecasting, inventory management, and logistics, new avenues for competitive advantage can be uncovered. Achieving these advantages can only occur when entire supply chains work seamlessly to leverage complementary capabilities. Collaboration can take the form of outsourcing operations functions to permit channel specialists to leverage their core competencies to supplement an internal functional weakness. Channel partnering can also take the form of strategic collaboration regarding product development, sourcing, marketing, production and capacity management, information technology, and distribution and delivery.

Third, the explosion in global trade has opened up new markets and new forms of competition virtually inaccessible just a few years ago. Leveraging the inactive power of today's Internet technologies and breakthroughs in international logistics, companies are no longer limited to selling and sourcing within their own national boundaries. Recently, global enterprises, fostered by international bodies and regional trade agreements, have been on a frantic search for business partners that will provide them not only with cost reductions but also access to resources and markets previously beyond their reach. Finally, E-business technologies have

enabled even the smallest of companies to assemble closely networked global supply chains, empowering them with the capability to implement competitive business models previously possessed by only the largest of corporations.

Fourth, today's marketplace requirement that companies be agile as well as efficient, in order to meet customer demand for shorter time frames in terms of services, product mixes, and volume and variety changes, has spawned the engineering of virtual organizations and interoperable processes impossible without supply chain collaboration. The conventional business paradigms assuming that each company was an island and that collaboration with other organizations, even direct customers and suppliers, was self-defeating. In contrast, market-leading enterprises depend on the creation of panchannel integrated processes that require the generation of organizational structures capable of merging similar capabilities, designing teams for the joint development of new products, productive processes, and information technologies, and structuring radically new forms of vertical integration. Today's most successful and revolutionary companies, such as Wal-Mart, Amazon.com, Intel, and others, know that continued market dominance will go to those who know how to harness the evolutionary processes taking place within their supply chains.

Finally, the application of breakthrough information technology tools centered on the Internet has enabled companies to look at their supply chains as a revolutionary source of competitive advantage. Before the Internet, businesses used their supply chain partners to realize tactical advantages, such as passing documents through electronic data interchange (EDI) and integrating logistics functions. With the advent of e-commerce, these tactical advantages have been dramatically enhanced with the addition of strategic capabilities that enable whole

supply chains to create radically new regions of marketplace value virtually impossible in the past. Enterprises are recognizing that the transfer of all functions of SCM to the Web will provide for the true integration of the customer value-enhancing capacities found among allied channel partners. As companies implement Internet technologies that connect all channel information, transactions, and decisions, whole channel systems will be able to continuously generate radically new sources of competitive advantage through cyber-collaboration, enabling joint product innovation, online buying markets, networked planning and operations management, and customer fulfillment.

For over a decade, market leading companies have been learning how to leverage the competitive strengths to be found in their business supply chains. Enterprises, such as Sun Microsystems, Microsoft, Siemens, Amazon.com, and Barnes & Noble.com, have been able to tap into the tremendous enabling power of SCM to tear down internal functional boundaries, leverage channel-wide human and technological capacities, and engineer "virtual" organizations capable of responding to new marketplace opportunities. With the application of E-business to SCM, these and other visionary companies are now generating the agile, scalable organizations capable of delivering to their customers' revolutionary levels of convenience, delivery reliability, speed to market, and product/service customization impossible without the Internet. Without a doubt, the merger of the SCM concept and the enabling power of the Internet are providing the basis for a profound transformation of the marketplace and the way business will be conducted in the twenty-first century.

2.2 The Evolution of Supply Chain Management

Even though the importance of the concept of SCM has appeared relatively recently, its development can be traced back to the rise of modern logistics. In fact, SCM is closely connected with and in many ways is the product of the significant changes that have occurred in logistics management. Over the past 30 years, logistics has progressed from a purely operational function to a key strategic component. As logistics has evolved through time, the basic features of SCM can also be identified. Logistics has always been about managing the synchronization of the needs of individual companies for product and service acquisition with the resources available from suppliers, on the other. The SCM concept, enhanced by the power of Internet technology, is the maturation of these basic value-added functions. This section seeks to explore briefly the origins of SCM and sets the stage for a full definition of e-SCM value chains to follow.

For centuries, enterprises have been faced with the fundamental problem that demand for goods and services often extended far beyond the location where products were made. It had always been the role of the logistics functions within the company to fill the gap in the marketing, distribution, and procurement systems by providing for the efficient and speedy movement of goods and services from the point of manufacture to the point of need. The critical dynamics of this process consist of time to delivery, cost and ease of exchange. Companies that have been able to effectively leverage the supply channels linking them with their customers and suppliers are able to more profitably operate and focus their productive functions, while extending their reach to capture marketplaces and generate demand beyond the compass of their physical locations. When viewed from this perspective, the supply chain

system concept can be described as a network of interdependent partners, who not only supply the necessary products and services to the channel system, but who also stimulate demand and facilitate the synchronization of the competencies and resources of the entire supply chain network to produce capabilities enabling a level of operational excellence and marketplace leadership unattainable by each business operating on its own.

Historically, synchronizing the supply chain has always occupied a central position in the management of the enterprise, linking business marketing and sales strategies with manufacturing, inventory, and service execution. As far back as the beginning of the twentieth century, economists considered the activities associated with effectively managing business channels to be the crucial mechanism by which goods and services were exchanged through the economics system. However, despite its importance, this concept, first termed logistics, was slow to develop. Most business executives considered the channel management function to be of only tactical importance and, because of the scope and lack of integration among supply network nodes, virtually impossible to manage as an integrated function. In fact, it was not until the late 1960s, when cost pressures and the availability of computerized information tools enabled forward-looking companies to begin to dramatically revamp the nature and function of the supply chain that the strategic opportunities afforded by logistics began to emerge.

The SCM concept could be said to consist of five distinct management stages. The first can be described as the era of internal logistics departmentalism. In the second stage, logistics began the migration from organizational decentralization to centralization of core functions driven by new attitudes associated with cost optimization and customer service. Stage three

witnessed the dramatic expansion of logistics beyond a narrow concern with internal warehousing and transportation to embrace new concepts calling for the linkage of internal operations with analogous functions performed by channel trading partners. As the concept of channel relationships grew, the old logistics concept evolved in stage-four to be full supply chain management. Today, with the application of Internet technology to the SCM concept, SCM can be described as entering stage five, e-SCM. Table 2-1 summarized these five stages.

SCM Stage	Time Frame	Focus
1	Late 19th Century to 1960s	Logistical Decentralization
2	1960s to 1980s	Total Cost Management
3	1980s to 1990s	Integration Functions
4	1990s to 2000s	Supply Chain Management
5	2000s to present	e-Supply Chain Management

Table 2-1 Supply Chain Management Stages

First Stage: Logistics Decentralization

Historically, the first stage of SCM occurred in the period extending from the late 19th century to the early 1960s. During the era logistics was not perceived as a source of significant competitive advantage. Viewed essentially as an intermediary function concerned with inventory management and delivery, it was felt that logistics could not make much of a contribution to profitability and, therefore, was not worthy of much capital investment. It was accorded little management status, and assigned less qualified staff. For the most part, companies segmented logistics activities, dividing them among operations functions, such as

sales, production, and accounting. Not only were activities that were naturally supportive, such as procurement management, inbound transportation, and inventory management, separated from one another, but narrow departmental performance measurements also pitted logistics functions against each other. The result was a rather disjointed, relatively uncoordinated, and costly management of logistics activities.

In an era when process and delivery cycle times were long, global competition practically non-existent, and the marketplace driven by mass production and mass distribution, logistics decentralization was a minor problem for most companies. By the early 1960s, however, changes in the business climate forced executives to rethink their logistics strategies. To begin with, expansion of product lines, demand for shorter cycle times, and growing competition had begun to expose the dramatic wastes and inefficiencies of logistics decentralization. Second, executives were finding themselves handcuffed by a lack of a unified logistics planning and execution strategy. Logistics responsibilities were scattered throughout the organization, and no single manager was responsible for integrating channel management activities with the rest of the business. Finally, logistics decentralization had made it impossible to pursue effective cost trade-off strategies. Logistics performance was often caught in a performance measurement paradox. For example, transportation might seek to reduce costs by requiring a higher payload-to-cost ratio, even if the decision resulted in higher inventories.

By the mid-1960s, it was clear that the existing structure and purpose of logistics and channel management functions were in need of serious revision. There was no standardization of terms or a commonly accepted vocabulary. No one was quite sure what form a revamped

logistics function should look like. Should it be attached to the firm's marketing function? Should it be attached to manufacturing? Should it be a department on its own? What would be the impact on logistics of the growth of computerized technology?

Second Stage: Total Cost Management

The second stage in the evolution of SCM can be said to be revolved around two critical focal points. The first can be described as the concerted effort made by companies to centralize logistics functions into a single management system. By merging what previously had been a series of fragmented functions into a single department, it would be possible to decrease individual costs associated with transportation, inventory, and physical distribution, while simultaneously increasing the productivity of the logistics system as a whole. Second, it was hoped that centralization would facilitate the application of the total cost concept to logistics. The objective of this strategy is to strive to minimize the total cost of logistics, rather than focus on reducing the costs of one or two specific logistics functions, such as transportation or warehousing. A much larger assumption was that, because logistics costs and customer service were reciprocal, it would be easy to calculate the cost trade-offs necessary to balance total logistics costs with marketing and sales objectives.

The movement toward logistics centralization was driven by three converging factors. To begin with, as the economic and energy crises of the mid-1970s dramatically drove up inventory carrying costs, the marketplace began to demand smaller order quantities and more frequent deliveries from their supply partners. Second, explosions in product lines during the

period required everyone in the supply channel to deliver products on time, avert obsolescence, and prevent channel inventory imbalances. Finally, new concepts of marketing, pricing, and promotion facilitated by the computer necessitated a thorough change in the cumbersome, fragmented methods of traditional channel management.

In addition to the operational demands driving reinvention of the logistics, a number of new ideas regarding the strategic place of logistics in the enterprise were emerging simultaneously. The first was the growing realization that, instead of a disconnected series of functions, logistics should rather be considered as a single integrated supply system. Complementary to this new idea of logistics was the application of new computerized technologies and management methods. During this period, computers became much more sophisticated, less costly, and more accessible. Also, new management methods centering on Just-In-Time (JIT), zero inventories, and quality management permitted companies to be more flexible and responsive, further eroding the old logistics model. Finally, logistics centralization was further accentuated by the realization that effective execution of logistics functions was critical to expanding customer service. As the era of mass production and mass distribution faded, companies found themselves looking to logistics capabilities to assist in gaining and sustaining competitive advantage through the coordination of channel resources.

Third Stage: Integrated Functions

During the 1980s, enterprise executives became increasingly aware that focusing solely on the total cost of logistics represented a passive approach to channel management. This awareness

was driven by the radical changes occurring in what was rapidly becoming a global marketplace. If the decade could be compressed into two quintessential catchwords, they would be competition and quality management. Competition came in the form of tremendous pressure from global companies, often deploying radically new management philosophies and organizational structures that realized unheard-of levels of productivity, quality, and profitability. The threat also came from a new view of the place of quality and how it could be implemented to capture marketplace advantage. Management concept, driven by IT and Total Quality Management (TQM) philosophies, were providing competitors with tools to compress time out of development cycles, engineer more flexible and "lean" processes, tap into the creative powers of the workforce, and generate entirely new forms of competitive advantages.

Businesses responded to these challenges by focusing, first of all, on revamping their organizations, either through corporate restructuring or by searching for methods to achieve cost reduction, work-force retraining, the application of technology to improve productivities, more careful use of fixed and variable assets, strategic outsourcing, and identification of customers, products, and markets providing the greatest potential for competitive advantage. Second, companies began to understand that logistics and other channel management functions could be leveraged as a dynamic force capable of wining customers beyond the execution of traditional marketing objectives. Competitive values, such as speed of delivery, value-added services, development time to market, materials acquisition, and product availability, could be realized when the entire organization worked together, both internally and in close collaboration with supply chain trading partners.

One of the most significant results of the challenges of the 1980s was the recognition that logistics itself constituted a significant competitive weapon. Up to this period, most executives had viewed logistics as playing a tactical role, with little impact on corporate strategic planning. By the mid-1980s, however, companies began to understand that, by enabling organizations to pursue both cost/operational and service/value advantages through continuous process improvement and closer integration with channel partners, logistics could provide enormous strategic value. By enabling trading partners not only to integrate their logistics functions but also to converge supporting efforts occurring in marketing, product development, inventory and manufacturing capacity planning, and quality management, companies could tap into reservoirs of "virtual" resources and competencies unattainable by even the largest of corporations acting independently. The realization of this opportunity is the subject matter of stage-four SCM.

Fourth Stage: Supply Chain Management

During the mid-1990s, companies began to expand the concepts of integrated logistics and supply channel management to embrace the new realities of the marketplace. The acceleration of globalization, the increasing power of the customer demanding ever higher levels of service and supplier agility, organizational reengineering, third-party outsourcing, and the growing pervasiveness of information technologies had forced businesses to look beyond the integrated logistics paradigm in the search for new strategic models. The pressure of responding to these new challenges compelled organizations to implement what only can be

called a dramatic paradigm shift from stage three logistics to SCM. As discussed above, the fundamental feature of the integrated logistics model was the merger of channel management functions with those of trading partners targeted at improving customer service and total cost reduction across whole channels. In contrast, at the core of phase four organizations is a distinct recognition that competitive advantage can only be built by optimizing and synchronizing the productive competencies of each channel trading partner to realize entirely new levels of customer value.

The differences between stage-three logistics and stage-four SCM can be clearly illustrated as below.

- **Plan:** In stage-three logistics, most business functions were still inward looking. Firms focused their energies on internal company scenario planning, business modeling, and corporate resource allocation management. ERP systems and sequential process management tools assisted managers to execute channel-level inventory flows, transportation, and customer fulfillment. In contrast, stage-four SCM companies began to perceive themselves and the supply-networks to which they belonged as "value chains". Knowing the total cost to all network partners and optimizing the customer-wining velocity of collective supply channel competencies became the central focus. Companies began to deploy channel optimization software and communications enabling tools like EDI to network their ERP systems, in order to provide visibility to requirements needs across the entire network.

- **Source:** Companies with stage-three sourcing functions utilize the integrated logistics concept to merge their procurement needs with the capabilities of their channel

suppliers. The goal is to reduce costs and lead times, share critical planning data, assure quality and delivery reliability, and develop win-win partnerships. In contrast, stage-four SCM sourcing functions perceive their suppliers as extensions of a single supply chain system. Besides achieving the benefits of integrated logistics, a critical goal of SCM-driven companies is to utilize channel data to execute volume purchasing to benefit all network trading partners. When possible, computerized extranet technologies are used to assemble channel collaborative relationships pointing toward consortia buying. Transportation and warehousing costs are reduced the overall assets invested in channel inventories.

- **Make:** Stage-three organizations resist sharing product design and process technologies. Normally, collaboration in this area is undertaken in response to quality management certification or when it is found to be more economical to outsource manufacturing. There is minimal networking between trading partners when it comes to computer aided design (CAD) and ERP manufacturing databases. Stage-four companies, on the other hand, seek to make collaborative design planning and scheduling with their supply chains a fundamental issue. When possible, they seek to closely integrate their ERP systems to eliminate time and cost up and down the supply channel. SCM firms also understand that speedy product design-to-market occurs when they seek to leverage the competencies and resources of channel partners to generate "virtual" manufacturing environments that are capable of being as agile and scaleable as necessary to take advantage of every marketplace opportunity.

- **Deliver:** Customer management in stage-three companies is squarely focused on making internal sales functions more efficient. A heavy priority is placed on basic available-to-promise functionality, finished goods management, and determining the proper timing of distribution channel differentiation. While there is some limited sharing of specific information on market segments and customers, databases are considered proprietary, and pricing data is rarely shared. In contrast, stage-four SCM firms are focused on reducing logistics costs and channel redundancies by converging channel partner warehouse space, transportation equipment, and delivery capabilities. Customer management looks toward automation tools to facilitate field sales, capability to promise tools, customer relationship management (CRM) software, mass customization, and availability of general supply chain repositories of joint trading partner market and customer data.

Stage-four SCM organizations possess the power to move beyond a narrow focus on channel logistics optimization to one where channel partners strive to identify the best core competencies and collaborative relationships among their trading partners in the search for new capabilities to realize continuous breakthroughs in product design, manufacturing, delivery, customer service, cost management, and value-added services before the competition. Through the application of SCM tools that seek to network whole supply channels, enterprises have the capability to view themselves and their channel partners as extended "virtual organizations" possessed of radically new methods of creating marketplace value.

Fifth Stage: e-Supply Chain Management

Today, the application of Internet technology has propelled the SCM concept to a new dimension. Originating as a management method to optimize internal costs and productivities, SCM has evolved, through the application of E-business technologies, into a powerful strategic function capable of engendering radically new customer value propositions through the architecting of external, Internet-enabled collaborative channel partnerships. Actualizing e-SCM is a three-step process. Companies begin first with the integration of supply channel functions with the enterprise. An example would be integrating sales and logistics so that the customer, rather than departmental measurements, would receive top attention. The next step would be to integrate across trading partners channel operations functions, such as transportation, channel inventories, and forecasting. Finally, the highest level would be achieved by utilizing the power of the Internet to synchronize the channel functions of the entire supply network into a single, scaleable "virtual" enterprise, capable of optimizing core competencies and resources from anywhere at any time in the supply chain to meet market opportunities.

With the application of e-business tools in this stage, there are enormous changes to SCM. Some highlights of those changes are as below:

Product and Process Design

As product life cycles continue to decline and development costs soar, firms have been quick to utilize Internet enablers to link customers to the design process, promote collaborative, cross-company design teams, and integrate physical and intellectual assets and competencies

in an effort to increase speed to market and time to profit. In the past, efforts utilizing traditional product data management systems and exchange to design data had been expensive, cumbersome, and inefficient. Internet technologies, on the other hand, now provide interoperable, low cost, real-time linkages between trading partners. For example, Adaptec, a semiconductor manufacturer, is connected through its web-based network to its manufacturing and assembly partners in Taiwan, Hong Kong, and Japan. During product development, chip designers send designs and diagrams through the network to their partner counterparts for review, simulation, and real-world testing. Test outcomes are immediately communicated to Adaptec for redesign or approval. Since the entire process can be performed in real time, produce design and market introduction have been dramatically cut.

E-Marketplace and Exchange

Sales and procurement have traditionally been concerned with proprietary channels characterized by long-term relationships, negotiation over lengthy contracts, long lead times, and fixed margins. Today, the Internet is completely reshaping this environment. Companies can now buy and sell across a wide variety of Internet-enabled marketplaces ranging from independent and private exchanges to auction sites. As an example, Ingersoll-Rand has launched a business-to-business (B2B) service provider unit designed to help companies with annual sales of under $900 million who purchase similar types of products as Ingersoll-Rand. The goal is to get participators from the bottom tier of the supply base to outsource their purchasing effort to the site. In addition, the site plans to give smaller suppliers a chance to participate in collaboration, program development, problem solving, and design issues.

Collaborative Planning

Historically, enterprises were averse to sharing critical planning information concerning forecasts, sales demand, supply requirements, and new product introduction. Such information was considered proprietary and strictly reserved for internal strategic planning functions. Today, as many organizations increasingly outsource non-core functions to network partners, the ability to transfer planning information online in real-time to what is rapidly becoming a "virtual" supply chain has become a necessity. The challenge has become how to transfer product and planning information across the business network to achieve the two-way collaboration necessary for joint decision-making. Fujitsu Computer Products of America, Inc. (FCA), San Jose CA, responded to the need for greater planning collaboration with their trading partners' data by implementing state-of-the-art supply chain planning software. The system provides FCPA employees with the ability to access and manage information about product forecasting, availability, and deployment throughout various stages in the supply chain process. The result is that FCPA can track inventory levels and sources of supply, evaluate options and make decisions quickly, and refresh the supply chain database as needed.

Fulfillment Management

The collapse of the dot-com era in 2000 revealed one of the great weaknesses of E-business. Customers may have access to product information and can place orders at the speed of light, but actual fulfillment is still a complex affair that occurs in the physical world of materials handling and transportation. Solving this crucial problem requires the highest level of supply chain collaboration and takes the form of substituting, as much as possible, information for physical flows of inventory. Some of the methods incorporate traditional tools, such as

product postponement, while others utilize Web-based network functions, providing logistics partners with the capability to consolidate and ship inventories from anywhere in the supply network and generate the physical infrastructures to traverse the "last mile" to the customer. An example would be the strategic partnership between Ford Motor Company and UPS Logistics: Auto-gistics. Using real-time Web-based technologies with leading edge distribution network design and execution, the alliance is designed to reduce by up to 40% the time required to deliver vehicles from Ford plants to the customer. The system provides pinpoint network operations capability through real-time reporting by Auto-gistics people at every node in the delivery channel.

From the discussion in this chapter, it is clear that channel management is no longer the loose combination of business functions characteristics of stages one and two logistics. New Internet-enabling technologies and management models have not only obscured company functional boundaries, they have also blurred the boundaries that separate trading partners, transforming once isolated channel functions into unified, "virtual" supply chain systems. Today's top companies are using Internet connectivity to reassemble and energize supply chain management processes that span trading partners to activate core competencies and accelerate cross-enterprise processes. They are also using Web technologies to enable new methods of providing customer value by opening new sales channels as they migrate from pure "bricks-and-mortar" to "click-and-mortar" business architectures.

Chapter 3: The Revolution of E-business

During the last two decades of the twentieth century, companies became aware that, to survive and flourish in the marketplace, they needed to expand their business strategies and operations processes beyond the borders of their virtual own enterprises to their trading partners out in the supply chain. Emphasis gradually shifted from a long-time concern with managing fairly static internal organization structures, cost and performance measurements, product design and marketing functions, and a localized view of the customer to a realization that new marketplace and technological forces and the accelerating speed of everything, from communications to product life cycles, were driving companies to look beyond their firms to their supply chains for sources of competitive advantages. By the end of the 1990s it was widely perceived that only those companies that could effect the collaboration of product resources and value-generating competencies with those of their supply network partners would be able to successfully take advantage of the new global marketplace. Supply Chain Management (SCM) was the management philosophy which was developed to flourish in this new economic environment, and quickly adopted as the core strategic model for most enterprises.

At the same time, radical breakthroughs in Internet technologies were providing the communications and transactions mediums that enabled the connectivity of SCM to move from a decoupled, serialized flow of inter-business competencies to the real-time integration and synchronization of every process and relationship occurring in the supply net work. Today, the Internet has driven SCM to an entirely different dimension, by enabling a global

ability to pass information and transact business friction-free anywhere, anytime, to customers, supplier, and trading partners.

In order to have a deep understanding of E-business, this chapter will explore the basis of the economic revolution driven by the Internet and E-business. It begins with a review of different categories of E-business. Next, it will further study the business dynamics driving the transformation to the E-business economy. Finally, the discussion will be focused on the fundamental principles of E-business.

3.1 The Communication of E-business

E-business, the Internet and the globalization all depend on each other. The more global players exist, the more E-business they want to do. The more E-business is online, the more people will be attracted to get direct Internet access. And the more people are online, the more global players will arise. Based on the way those people are communicating online, E-business can be at least divided into nine different categories, which is shown in Table 3-1.

As we can see from Table 3-1, the customers can sell items directly to other customers (e.g. like the C2C eBay online auction business that allows people to auction items they own to other people directly), or as a C2B organization where online registrations can be performed for products consumers purchase, or as a C2G organization where individual voters in the United States can contact their governmental representatives directly over the Internet. The B2C organizations are now able, through online registration, to keep better track of their customers for purposes of product recalls and product updates. The B2B organizations can

transact product and material purchases, share design specifications for new products, and perform research and development activities all online. The B2G organizations allow businesses to fulfill government obligations on reporting their behavior on such issues of environmentalism, taxes, and legal actions in a timely manner.

From \ To	Customer	Business	Government
Customer	Customer-to-Customer (C2C)	Customer-to-Business (C2B)	Customer-to-Government (C2G)
Business	Business-to-Customer (B2C)	Business-to-Business (B2B)	Business-to-Government (B2G)
Government	Government-to-Customer (G2C)	Government-to-Business (G2B)	Government-to-Government (G2G)

Table 3-1 Categories of E-business

All of the G2C, G2B and G2G organizations can share information required by law and current legislation that might otherwise take years to convey. These governmental organizations allow for a much needed experience in the dissemination of information concerning the governance of people and assurance that laws will be promptly obeyed.

Technically there is no difference among these categories. E-business includes all transactions internal to the business organizations and those external with customers and government agencies. Therefore there are not fundamental distinctions between these forms of networks. The electronic business that can be conducted is basically the same.

3.2 Business Dynamics in Internet Environment

The Internet has dramatically changed forever the way both individuals and companies approach not only the processes of buying and selling products and services, but also how they communicate with each other, the mediums by which the knowledge is transferred, even how they will be entertained. In the late 1990s, the marketplace had become aware of a definite acceleration in the speed of change shaping the business environment. Management buzzwords, such as agile enterprises, virtual organizations, total quality management, business process engineering, and lean manufacturing, all focused on a common theme: how to eliminate time and costs from the process while providing new levels of customer satisfaction across whole supply channels. Today, the development and utilization of the Internet as the global standard for both communications and commerce has so dramatically increased the velocity of change that it has produced a virtual inflection point obsoleting previously accepted norms of how the marketplace works. What capabilities does the Internet offer enterprises that they did not have before? How does the Internet fundamentally change the business landscape? Actually Internet provides an example of "disruptive technology". According to the Law of Disruption, changes in the social, political, and economic environment occur incrementally, while changes in technology are exponential in nature and cause order-of-magnitude shifts in the environment that negate rated rules of engagement. For example, the enabling power of the Internet inaugurated a change in the way business is conducted that was on another level in comparison to the incrementalist strategies of process management tools such as ERP, TQM, and JIT.

Why the Internet has been so disruptive to what now is termed the "old economy" is simple, yet at the same time, profound. First of all, the Internet has not only increased the ability for companies to network databases and information, but also enhanced the very nature of information itself. Second, The Internet enables companies not only to communicate globally, but also to broadcast business rules and processes in real time. The Internet enables the shift from focusing on optimizing individual channel components to optimizing the performance of the entire supply chain. Finally, the Internet enables the activation of networks of cross-channel knowledge repositories that permit agents anywhere, at anytime, to access data and execute transactions with customers, suppliers, or channel partners.

In the following section, the key business dynamics driven by the Internet will be discussed. Fundamentally, the changes attributed to each of the dynamics represent a radical departure from the past and a roadmap to the future.

1. Customer Dynamics

In the past, businesses competed by marketing product lines consisting of standardized, mass-produced products. Today, customers are demanding to be treated as unique individuals and expecting their suppliers to provide configurable, solutions-oriented bundles of products, services, and information capable of evolving through time as their requirements change. In addition, with their expectations set by "world class" companies across global marketplaces, customers are demanding that their supply channels provide the highest quality for the lowest price, quick response deliveries, and ease of order management and customer service. This

new business mission is perhaps best summarized as from being product focused to solutions focused.

This migration of marketplace power from producers and sellers to buyers and consumers is being accelerated and amplified by the Internet revolution. Today's e-customer is demanding the suppliers provide Web-based capabilities, and because of the expansion of the Internet users, there can be expected that most of tomorrow's customer will be e-customers. E-customers are very different from traditional customers. They are entrepreneurial and independent and prefer to transact business at self-service model. They also want access to information from anywhere at any time. They are more apt to work with their suppliers using the Internet and emails than telephones and faxes. In addition, they expect a higher level of collaboration when it comes to pricing, promotions, and changes to product lines. Because e-customers work in a fast paced environment, they are less tolerant of missed delivery dates, inaccurate invoice, and other impediments that retard the pace of business. In short, "e-customers expect much more from their business relationships[1]."

The use of Web technologies has added several new dimensions to the equation that has virtually reengineered the customer satisfaction processes. First, E-business implies that suppliers are expected to provide all-round 24 hours 7 days business coverage. This means e-enterprises must be able to construct systems that are not only technically available and reliable, but also dynamically scalable to service spikes in demand without going off-line. Second, e-customers expect their suppliers to expand their Web capabilities by integrating new technologies. Today's fast-paced and increasingly Internet-enabled customer demands

[1] Fleischaker, Celia, "*e-Customers: How the Internet is Changing the Way you Do Business*," Midrange ERP, 4, 5, 2000, 46.

access devices to conduct E-business regardless of the medium. Third, the Internet provides companies with unparalleled opportunities to customize product and service offerings to match the individual needs of each customer. By assembling demand pattern portfolios, businesses can develop tailored marketing presentations to their customers that zero in on their buying requirements, while simultaneously eliminating the time customers must search for the right solution. Driven by the communications power of the Internet, marketers can engage in a variety of cross-selling and up-selling opportunities, while reaching each customer in real time, one-to-one. In addition, Web functions enabling the customer to access a company's service resources, so that they self-service their product questions and order queries, further increases customer management of the buying experience. While company resources become more visible and accessible through self-service, the overall cost to provide quality service will also decline. Finally, the emergence of e-customers has resulted in a new form of customer relationship management (CRM) – e-CRM. The goal is to utilize the Internet to cement new customer loyalties through the digitized care and feeding of the marketplace. At Rockwell International, a B2B portal termed SourceAlliance.com and several on-line Web stores were created to provide customers a seamless one-step shopping experience, where they can buy hardware needed to connect control hardware and software to plant floor networks. Customers can take advantage of account personalization, flexible ordering and shipping options, and customized, Web-based reporting of contracts. According to Rod Michael, e-business solutions manager, customers can also link their procurement systems directly to Rockwell's Internet CRM system, enabling Rockwell "to integrated right into their workflow and not just be an add-on."[2]

[2] Paul, Lauren Gibbons, "*The E-business Frontier*," Managing Automation, 15, 8, 2000, 34.

Therefore, the e-CRM concept has provided today's customer with radically new resources to demand the highest quality, configure products that fit their individual needs, and service themselves, all at the lowest cost possible. For suppliers, the Internet has provided unprecedented opportunities to leverage software applications and processes that enable sales, marketing, and service to engineer strong relationships with their customers. By permitting them to reach through the Web into their supplier's market-facing functions to place an order, view inventory status, check on a delivery, and perform a host of other e-enabled functions, customers are empowered and will want to repeat the personalized experience. In this sense, the Internet provides them with the necessary feeling of having received superior value and a stronger sense of commitment to the supplier – all critical marketplaces attributes in an environment where dissatisfied customers are merely a click away from the competition.

2. Product Cycle Dynamics

Internet speeds up the requirements of providing products and service bundles. In order to meet this new change, producers have had to revolutionize the way they previously designed, manufactured, and distributed products to the marketplace. In the past, companies competed by selling standardized average quality and availability. Pricing was fixed, and the relationship with the customer was one-dimensional. Today, the old paradigms driving production and distribution have been obsoleted by the ability of the Internet to leverage the collaborative capabilities of channel trading partners to accelerate the speed by which products and services values are generated and distributed. Marketplace leaders must be able to tap into the competencies of their channel networks if they expect to continuously produce

and deliver products and services capable of the rapid development, deployment, and configurability that add customer value and secure competitive survival.

Materializing Internet-driven expectations about this new view of products and services is e-collaborative product lifecycle management (PLM). PLM requires producers and suppliers to think of the entire process of conceiving, designing, planning, procuring, producing, and selling a product as a closely integrated activity in which collaborative commerce systems hold the post position. Although integrating such systems is still on the horizon, the applications are being assembled today that will permit many-to-many B2B synchronization, expose constraints as they emerge across the supplier network, alert the appropriate product life cycle teams, and synchronize the workflow. The benefits of such integration are obvious – reduced product design time through producer/supplier collaboration, reduced costs for procurement, and faster time to market. Collaborative PLM rests upon three critical components: product development, planning, and procurement. Collaborative product development requires designers and engineers to be able to communicate product data management (PDM) in an interactive, real time manner. The goal is to use the Internet to provide portals synchronizing producers, suppliers, and customers, where such data as bills of material, outsourcing information, CAD drawings, design updates, and build schedules can be interactively shared among diverse development teams. This piece permits the PDM engineer, whether that person is within the plant or outside of it, to see the impact of a particular design or a change to be made, and possibly even to suggest a superior alternative.

To make PDM activities really work, however, it is essential that the effort also includes extensive use of collaborative planning, not only for traditional supply chain demand,

replenishment, and capacity planning, but also for new product design. The objective is to integrate collaborative planning, forecasting, and replenishment technologies with e-collaborative PDM systems. A merger of both technologies would provide engineers and suppliers with the visibility to determine the best time to make a design change or, perhaps make no change at all. In addition, to manage design content and engineering changes, designers will be able to source and procure materials directly through a virtual manufacturing network. Finally, by providing real-time information about supply network constraints, such as capacity bottlenecks or critical material shortages, PDM design teams can make more effective decisions early in the design process. While there are many obstacles to realizing such a level of cooperation, from reshaping market exchanges to tackling the issue of combining and converging so many different types of software, forward-looking companies are always ready diving straight in and developing it to be part of their competitive advantage.

3. Information Technology Dynamics

About a decade ago, the Information Age was raised from the end of the Industrial Age. After a decade history of Information Age, what constituted the fundamental source of wealth was obviously information, rather than productive assets, materials, and labor. The capture, compilation, and communication of information could provide companies with radically new ventures to generate wealth by reaching previously inaccessible markets, providing revolutionary mediums for the transfer of goods and services, enabling new ways to capture customer loyalty, and enabling innovative companies to do things they never dreamt they could do. What this meant for business was that technology would be perceived not only as an

effective management tool that shortens cycle times and increases productivity through automation but also as a key enabler, providing companies with the opportunity to activate highly competitive organizations and channel networks that engendered radically new markets and breakthrough business models.

Today, the effective management of information has been propelled to a new dimension by the integrative power of the Internet. And what is at the heart of the Internet revolution is ubiquity, which means existing everywhere at the same time. The Internet enables companies to transform not just internal processes but whole industries – customers, suppliers, and trading partners who inhabit intersecting value chain communities. Today's most forward-looking companies understand that the World Wide Web is not simply a technical mechanism that facilitates communication; it is now the nervous system of a new business infrastructure that will profoundly affect the organization of work, the mediums by which enterprises respond to each other, and the way global economies will be conducted.

Constructing the global knowledge network and engineering new digital enterprise models has already begun. According to Raish[3], the emerging knowledge network began "first with the foundation of a standardized global telecommunication network, followed by a universal data and rich media network that is provided via the global Internet, and finally via communication, collaboration, and enterprise application integration (EAI) solutions, which are being introduced at a breakneck pace." Despite the disappointments of the dot-com crash and the tremendous difficulties in overcoming technical and trust issues, companies all along the value chain are recognizing that information collaboration, ranging from marketing

[3] Raish, Warren D., *The E-Marketplace: Strategies for Success in B2B Commerce*, McGraw-Hill, New York, 2001, 166.

information, to inventory, to product design and forecasting, enables enterprises to structure powerful knowledge networks to engineer new competitive space that transcends the limitations of time, geography, and talent.

Constructing the Internet knowledge network consists of a matrix of business system architectures that enable the convergence of virtual teams to focus on the collaborative identification, linking, sharing, and evaluation of entire value chain information assets. There is one framework about Internet knowledge network proposed by Taylor and Terhune[4].

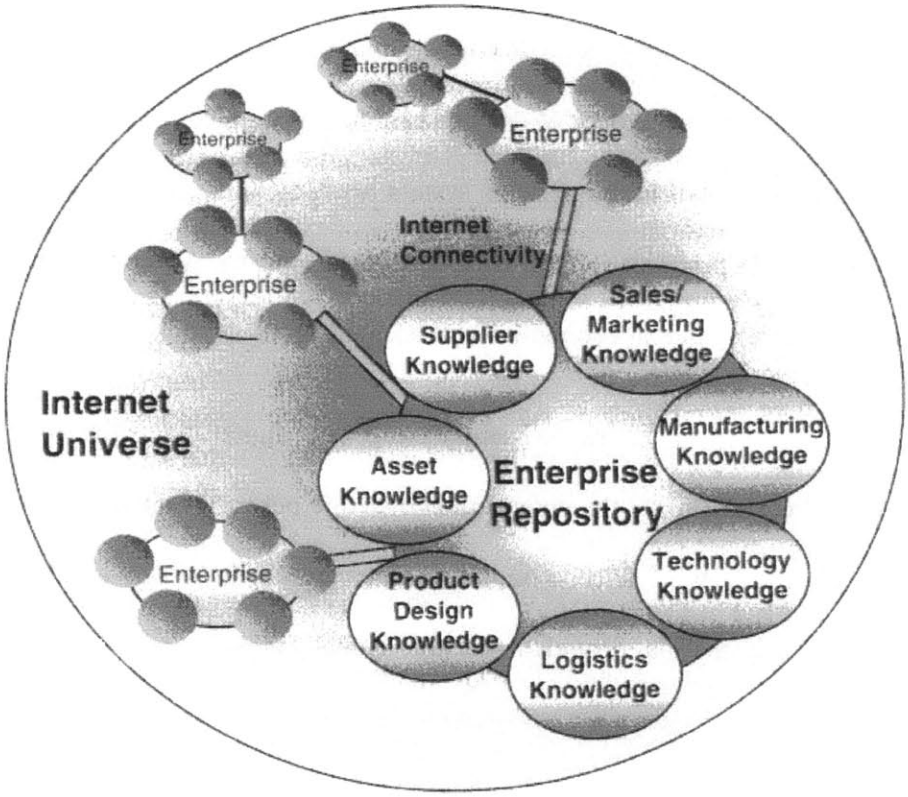

Figure 3-1 Internet Knowledge Connectivity[5]

[4] Taylor, David and Terhune, Alyse, *Doing E-Business: Strategies for Thriving in an Electronic Marketplace*, John Wiley, New York, 2001.
[5] Same as previous footnote.

As illustrated in Figure 3-1, knowledge networks are composed of "knowledge hubs", consisting of individual enterprises ringed by internal information entities. Connectivity of knowledge hubs is made possible by Internet technologies, which provide a virtual workspace for collaborative communication and workflow. Evolving e-marketplaces will seek to leverage this information to drive reconfigured processes targeted at offering new products, services, and information back through the channel network.

4. Global Channel Dynamics

One of the key components in the development of today's E-business environment is the emergence of the global economy. During the concluding decades of the twentieth century, the end of the Cold War, the opening of markets in Eastern Europe and Asia, the proliferation of communications technologies, the speed of transportation, and the virtual integration of the world's economic activities have propelled companies, large and small, into the global marketplace at a dizzying pace. This explosion in international trade has been spurred by a number of factors. To begin with, the maturing of global economics has enabled companies to view the remotest places on earth as potential areas for market development. The general growth of global wealth, the establishment of workable distribution systems, and the speed of communications have increased the world's appetite for products and services and spawned new market opportunities. In addition, strategies focused on leveraging the core competencies of business partners across the globe have provided radically new opportunities to expand processes and opportunities unreachable for individual companies confined with national

boundaries. Finally, the emergence of the World Wide Web has enabled anyone from anywhere at any time, to access information and transact business without regard for the limitations of time or geography.

Based on this feature of Internet economy, the world's leading enterprises are aggressively seeking to carve out their own space in the growing global Internet economy. Some companies are trying to gain recognition as early leaders in global Internet business as part of their overall corporate strategies. Similar to the rush to establish bricks-and-mortar businesses in foreign lands, characteristic of the past, today's firms are eager to leverage E-business to lower procurement and inventory costs while tapping into new sources of revenue. And as global companies of the past have experienced, setting up assets is one thing: marketing to different cultures, understanding local political economies, developing structural and organizational backbones, and working with country-specific commerce and regulatory practices necessary to realize a global Internet strategy is another. How to build a successful global Internet commerce will primarily focus on the following issues:

- *Building effective channel alliances.* Although companies driven by Internet are facing competition from anywhere on the world, they have been provided tremendous opportunities through Internet to implement collaborative E-business strategies to leverage the intellectual, material and marketing resources of business partners worldwide to penetrate overseas markets easier and more cost-effectively.

- *Building global collaboration.* Since the global resources are linked closer together by Internet, companies using Internet are finding it easier to coordinate design, product manufacture, marketing, and distribution processes with international

partners to establish "virtual" global enterprises capable of responding to any customer opportunities.

- *Globalizing Internet Content.* Globalizing the Internet content means being able to provide presentational content that is localized and personalized to meet the cultural, language, currency, commercial practices, local news, and tastes of the customer.

- *Responding to international governments.* Internet economy draws the world closer together and requires more responding to various government issues from different countries. International commerce bodies like the World Trade Organization (WTO) and others will have to assist governments to find consensus on global E-business trading practices. On the other side, governing bodies will have to arrive at policies that are consistent with national objectives, and also provide international rules that foster the flourishing of the Internet economy.

- *Global Strategy Development.* The capability of the Internet dramatically increases supply chain connectivity and radical improvements in logistics system. This enabled the feasibility of a single, globally networked supply system, which links trading partners together to generate product and service from sources everywhere to fill the customer demand everywhere.

5. Supply Chain Dynamics

The speed of product and service innovation, the emergency of global marketplaces, the expectation of customers and the radical opportunities for collaboration and connectivity offered by the Internet have dramatically altered the structure and mission of supply chain. In the past, supply chain was perceived primarily as an operation function concerned about transportation, warehousing and inventory management. However, today's enterprise views supply chain as a competitive weapon to implement strategy, which not only delivery product and service at the lowest cost but also enable enterprises to synchronize materials and information from one end of the supply network to the other. Further, with the application of Internet, supply chain becomes E-supply chain. Its role expands from a linear transfer of products and information to the generation of scalable virtual supply networks, which includes dynamic sourcing, dynamic deployment, and real-time fulfillment.

Since E-supply chain utilizes the integrative and collaborative capabilities in the Internet to manage supply chain process, it becomes a critical enabler of E-business, or can be said to be a direct component of E-business. It can provide the technologies to execute Web-generated requirements for product fulfillment and supply channel information, therefore, to some extent, E-supply chain is a fundamental driver of E-business. The following are some critical marketplace dynamics driven by the E-supply chain:

- *Visibility.* E-supply chain visibility enables real-time analysis and event management to direct the flow of materials and information up and down the value network.

- *Fulfillment.* It is obvious that Internet presentational content will increase the customer's attention and facilitate the buying experience. However, the true loyalty can only be won when the product or service solution is delivered to meet

expectations. Therefore, one of the primary functions of E-supply chain is to synchronize supply channel resources to realize the immediacy of product or service delivery as close as possible.

- *Globalization.* How to respond effectively to the requirements to produce and market goods on a global scale is a new challenge for supply chain in Internet economy. Apply Web-based solutions to supply chain can enable global companies to deploy resources from anywhere in the world to meet delivery requirement.

- *Optimization.* E-supply chain is gradually transforming the original optimization on a single node within the supply network to the entire optimization on the network. By applying e-information enablers to supply chain functions, virtual supply channels will be able to respond to market requirements at Internet speed.

- *Fixed Asset Reduction.* Today's enterprise is continually seeking to cut investment in distribution assets and reduce the proliferation of inventory throughout the supply chain. A fundamental objective of e-supply chain is to leverage information about demand and supply dynamics whenever possible as a substitute for inventories and physical handling.

- *Outsourcing.* Today's enterprise is constantly reviewing internal processes in an effort to eliminate non-core competency functions. E-supply chain facilitates business collaboration by linking enterprise requirements to alternative resources and competencies from anywhere in the supply network.

- *Value-added automation.* By providing the real-time linkage of information nodes across the entire supply channel, E-supply chain decreases response times, decreases work-in-process (WIP) costs, increases the velocity of time fulfillment and lowers labor requirements.

Today, the goal of Internet-enabled supply chain is to provide entire supply channels with marketplace knowledge exchanges that will facilitate joint decision making. As Internet technology become more mature, the real value of E-supply chain will move from physical aspects of delivery mechanisms, to linking sources of network competencies to deal with other critical issues, such as customer expectation, product development, global trading and supply chain collaboration.

Chapter 4: Strategic Impact of E-business on ISCM

In general, the impact of the Internet and E-business on the economy has been tremendous and changes are happening extremely fast. For example, the Business-to-Customer (B2C) model adopted by Dell Computers and Amazon.com enables customers to order products over the Internet without relying on third party distributors. In the mean time, the Internet and those emerging E-business models have enabled supply chain problems to be resolved by applying these new technology and business models all over the world.

4.1 Industry Review of E-business Strategy

E-business strategies were supposed to reduce cost, increase service level, increase flexibility and profit. However, the reality has not been always reflecting these hopes since some of the new E-business didn't reach their full promise. And in many cases, the downfall or failure of some Internet business has been attributed to their logistics strategies. Below are some examples to illustrate the E-business application in different industries.

Online Furniture Industry

The furniture industry seemed very anxious for online sales when Living.com purchased Shaw Furniture Galley in March 1999. And Shaw Furniture Galley was the Top 10 largest

furniture store in North Carolina at that time. Living.com was intended to use this deal as an access to top furniture manufacturers who had resistance to online sales and preferred traditional showrooms. However, after $70 million capital investment and obtaining an exclusive furniture link at Amazon.com, Living.com declared bankruptcy on Aug. 29, 2000. One of the two primary reasons for the failure was that their information system didn't function correctly, the other one was 30% amazing return rate due to inexperienced delivery partner in furniture industry.

Online Grocery Industry

Peapod, founded at Illinois in 1989, was considered as one of the leading online grocers in U.S. As a highly experienced online grocer, the company served more than 130,000 customers. However, it generated a loss of $29 million with about $73 million sales. This huge loss and no additional funding caused Peapod to be acquired in April 2000 by Royal Ahold, which is a international food company. Compared with other online grocery store, such as shoplink.com, streamlink.com, which had to retired from online grocery market, Peapod was still very lucky. The primary reason for the collapses in the online grocery industry is due to high delivery costs.

Online Bookstore

Amazon.com started in 1994, was considered as the largest bookstore on the earth and now is growing to be the largest online store. The company primarily offers millions of books, DVDs, CDs, videos, toys, and electronics. Its service also includes providing auction for different items, conducting comparison shopping, website hosting. Amazon.com is still expanding its online product in many categories, such as pet supplies, cars, drugs. Amazon.com has become a role model for Internet companies by placing market share ahead of profits and making acquisitions by its market capitalization. Currently, Amazon has established separate websites in Canada, U.K., Germany, France, China and Japan and it ships globally.

Dell Computers

Dell was founded by Michael Dell in 1984. The company is based on a simple concept: by selling computer systems directly to customers, Dell could best understand their needs and efficiently provide the most effective computing solutions to meet those needs. This direct model allows the company to build every system to order and offer customers powerful, richly-configured systems at competitive prices. Dell's success also attributes to its virtual integration, a strategy that is achieved by eliminating the traditional boundaries between suppliers, manufacturers, and end users. Dell's decision to sell product built from components produced by other manufacturers has relieved Dell of the burden of owing assets, research and development risks and the burden of managing a large workforce. At the same time, Dell only produces to order and keeps no finished goods inventory. These business decisions have

allowed Dell to grow much faster than its competitors and only maintain about 7 days of inventory.

Among above examples, obviously some companies are extremely successful in developing new E-business models that allow them to increase profits significantly and capture a sizable market share while the new business models seem to fail in some cases. What makes the difference? It seems to require a better understanding of Internet based supply chain strategies, which will be discussed in the next section.

4.2 Push-Pull Supply Chain Strategy

Many companies have recognized that the Internet can have a huge impact on supply chain performance. These companies observed that Internet could help them move away from the traditional Push strategy employed by most supply chains and eventually end up with a hybrid strategy, Push-Pull supply chain.

Push Supply Chains:

In a typical Push supply chain, production and distribution are based on long-term forecasts. The manufacturer uses orders received from the retailer's warehouses to forecast demand. It therefore takes much longer for a push-based supply chain to react to the changing marketplace. In addition, since long-term forecasts pay an important role, it is important to understand the following principles of all forecasts and their impact on the supply chain.

- *The forecast is always wrong.* This implies that it is difficult to match supply and demand.

- *The longer the forecast horizon, the worse is the forecast.* This implies that it is even more difficult if one needs to predict customer demand for a long period of time.

- *Data update lead to forecast update.* This suggests that as the firm receives more demand data, it uses the data to update its forecast, and therefore update inventory levels, safety stock and order quantities.

- *Aggregate forecasts are more accurate.* This implies that traditional inventory management techniques practiced at each level of the supply chain lead to the Bullwhip Effects, which is a phenomenon common in Push supply chains. And the Bullwhip Effect (Figure 4.1) suggests that variability of orders received from retailers and warehouses is much larger than variability in customer demand. This increase in variability is directly associated with supply chain lead-time. The longer the lead-time, the larger the increase in variability.

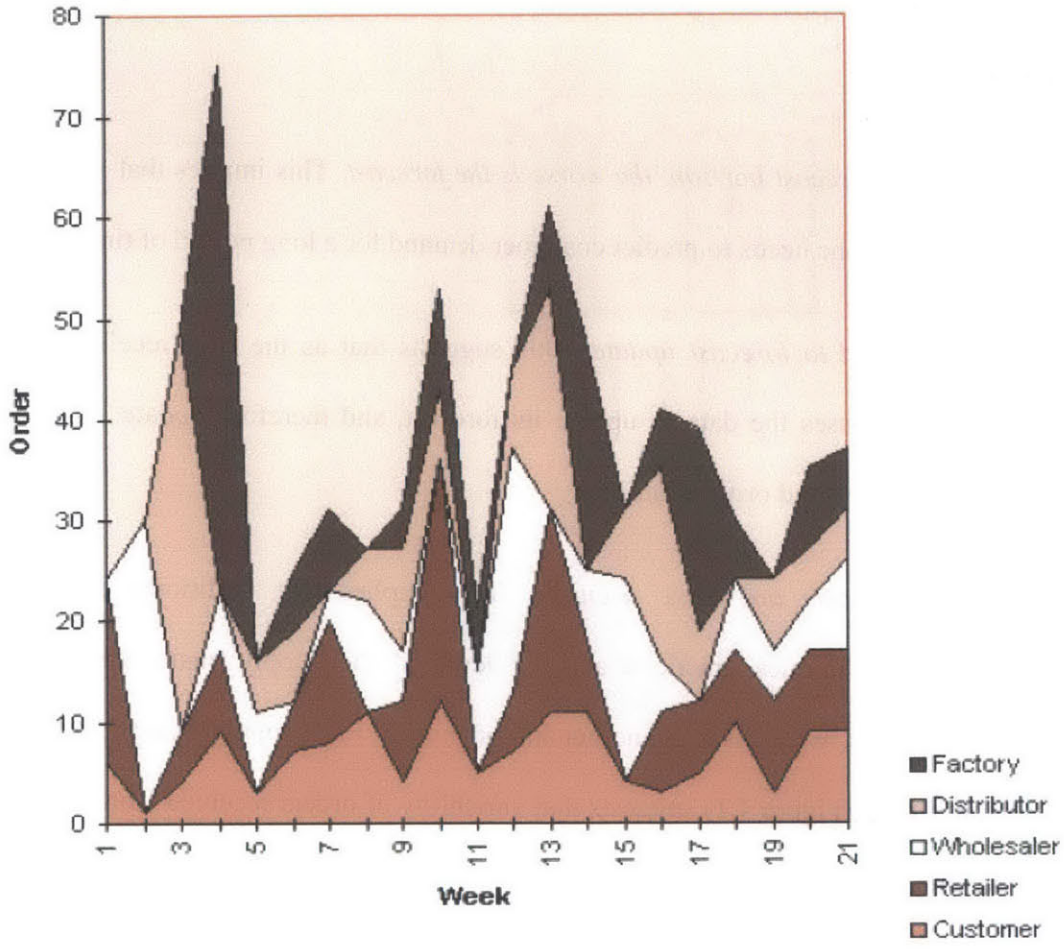

Figure 4-1 the Bullwhip Effect: Order Variability in the Supply Chain

(Source: Designing and Managing the Supply Chain, Simichi-Levi, McGraw-Hill.)

Pull Supply Chains:

In a typical Pull supply chain, production and distribution are demand driven, which means they are coordinated with true customer demand rather than forecast. The company does not hold any inventory and only produces to order in a pure Pull system. Intuitively these systems

are attractive since they allow the company to eliminate inventory, reduce the Bullwhip effect and increase service levels.

However, it is very difficult to implement a Pull supply chain strategy when the lead times are too long to respond to demand information practically. In addition, it is more difficult in a Pull strategy to take advantage of economics of scale since production and distribution decisions are in response to specific customer demand.

Above advantages and disadvantages of Push and Pull supply chains have led companies to look for a new supply chain strategy in order to take advantage of both systems. Therefore, a hybrid of these two systems is developed as Push-Pull Supply Chain.

Push-Pull Supply Chains:

In a typical Push-Pull supply chain, some stages typically the initial stages are operated in a push-based manner while the remaining stages are operated in a pull-based strategy. The interface between the push-based stages and the pull-based stages is defined as *the push-pull strategy.*

For example, a PC manufacturer is following a typical Push system if it builds to stock and thus makes all production and distribution decisions based on forecast. However, in a Push-Pull strategy, the component inventory is managed based on forecast but final assembly is in response to a specific customer request. Therefore, the push part is the part of the company's supply chain prior to assembly; the pull part is the part of the supply chain which starts with

assembly and responds to actual customer demand. It is observed that the company takes one of the advantages of Push System, which is A*ggregate forecasts are more accurate*. The primary reason is that the demand for component is actually an aggregation of demand of all finished products which use this component. Since aggregate forecasts are more accurate, uncertainty in component demand is much smaller than uncertainty in finished goods demand. Obviously this leads to safety stock reduction. Dell Computers is an excellent example of the typical Push-Pull supply chain.

Another example of a Push-Pull strategy is the postponement in product design. In this case, the company designs both the generic product and specific product which is differentiated from the generic product. Then the manufacturing process starts by producing the generic product and delay the manufacturing decisions about specific product until demand reveals itself. Therefore, the portion of the supply chain prior to product differentiation is typically a push-based system, which means the generic product is produced based on long-term forecasts. And the demand for the generic product is an aggregation of demand for all its corresponding specific end products, therefore forecasts are more accurate and inventory levels are reduced as well. Differently, the demand for a specific product usually has a higher uncertainty and using product differentiation only response to individual demand. Thus, the part of supply chain starting from the product differentiation is following pull strategy.

4.3 The Evolution of Supply Chain Strategy

After the introduction of Push-Pull supply chain strategy in last section, this section will continue to discuss how different kinds of industries moved from Push strategy, initially to Pull strategy, and eventually to Push-Pull supply chain strategy.

The Grocery Industry

Grocery industry is a very traditional industry based on Push supply chain strategy. A typically Push-based supermarket managing inventory at the warehouses and stores are based on forecast. Taking the previous Peapod as example, when Peapod was founded in the beginning as online grocery store, its supply chain strategy was to establish a pure Pull system with no inventory and no facilities. When a customer ordered grocery, Peapod would pick the products at a supermarket nearby. This strategy had significant service problems because their stock-out rates were very high, about 8-10%. Later on, Peapod changed its business model to a Push-Pull strategy by establishing some warehouses and thus stock-out rates were reduced to less than 2%. In this case, the portion of the supply chain prior to fulfilling customer order is the Push part while the portion after customer order is the Pull part. In addition, since Peapod's warehouse covers a broad geographical area larger than a single supermarket, customer demand is aggregated across many locations. Thus better forecasts and inventory are achieved.

The Book Industry

The book industry is another excellent example of the evolution of supply chain strategies from Push to Pull and then to Push-Pull. Traditional bookstore, like Barnes and Noble had a typical Push supply chain with their physical stores. When Amazon.com was established in 1994, their supply chain was a pure Pull system with no warehouses and no stock. At that time Amazon was using Ingram Book as a supplier to met most of customer demands. Thus the Pull model was considered as an appropriate strategy when it was building its brand name. However, as volume and demand increased, two issues became serious. First, Amazon.com's service level was affected by Ingram Book's distribution capacity. For example, Amazon.com could not meet its service level goals during the period of peak demand, such as Christmas, Thanksgiving. Second, using Ingram book in the first few years allowed Amazon.com to avoid inventory costs but significantly reduced profit margins. As demand increased, obviously Ingram Book couldn't provide any advantage from many of the book categories. Therefore, in the later stage, Amazon.com changed its philosophy and established several warehouses around the country where they keep stock of most of books they sell. The inventory at the warehouses is managed based on long-term forecast (Push strategy) while the demand is fulfilled based on individual request (Pull strategy).

The Retail Industry

Comparing with other industries, the retail industry was kind of late to respond to competition from the virtual stores and to recognize the opportunities provided by the Internet. However,

recently more and more "Brick and Mortar" companies have added an Internet shopping component to their offering, such as Wal-Mart, Target, BestBuy. And these retailers have recognized the advantage that they have over the pure Internet companies since they already have the warehousing infrastructure and distribution channels. Their virtual retail stores were established to be served by their existing warehousing and distribution infrastructures. As a result of going online, "Click and Mortar" have changed their approach to stocking in their various warehouses. On one side, fast moving product whose demand can be accurately matched with supply based long-term forecasts are stocked in stores. On the other side, slow-moving products, which have highly uncertain demand levels and require high levels of safety, are stocked centrally for online purchasing. In this case, centralizing stocking can effectively reduce uncertainties by aggregating demand across geographical locations.

4.4 The Impact of Supply Chain Strategy on Fulfillment

From the previous review of the evolution of supply chain strategies, it is obvious that the Internet and associated supply chain introduce a shift in fulfillment strategies: from cases and bulk shipments to single items and smaller size shipments; from shipping to a small number of stores to serving highly geographically dispersed customers. This shift has also increased the importance and the complexity of reverse logistics.

This new shift or development in supply chain strategies is very good for the parcel and LTL (Less than Truckload) transportation industries. Both the Pull and the Pull systems rely heavily on individual shipments rather than bulk shipments. This is more obvious in the

Business-to-Customer model. Therefore, a new term has been developed to describe this strategy, *e-fulfillment*. Another impact of e-fulfillment on the transportation industry is the significant increase in reverse logistics. In the business to consumer arena, e-fulfillment typically means that the supplier needs to handle many returns, each of which consists of a small shipment. This is because online retailers need to build customer trust through generous return terms. Since the LTL industry traditionally has not been involved as much in Door-to-Door services, e-fulfillment becomes a challenge for them.

	Traditional Fulfillment	E-fulfillment
Supply Chain Strategy	Push	Push-Pull
Shipment	Bulk	Parcel
Reverse Logistics	Small portion, Less Complex	Important, Large portion and highly complex
Delivery Destination	Small numbers of stores	Large numbers of geographically dispersed customers
Lead Times	Relatively Long	Relatively Short

Table 4-1 Traditional Fulfilment and E-fulfillment

(Source: Designing and Managing the Supply Chain, Simichi-Levi, McGraw-Hill)

Typically, e-fulfillment logistics requires short lead-time, ability to serve globally dispersed customers and the ability to reverse the flow easily from B2C to C2B. Only parcel shipping can do all that and one important advantage of the parcel industry is the existence of an excellent information infrastructure that enables real-time tracking. Therefore, the future

looks more promising for the parcel shipping industry, and particularly for those carriers and consolidators who work to modify their own systems in order to integrate it with their customers' supply chains. (Table 4-1 summarize the impact of the E-business on Fulfillment Strategies)

4.5 How to Identify the Appropriate Supply Chain Strategy

From the previous discussion, it is evident that the appropriate supply chain strategy depends on the industry, the company, and individual products. Generally speaking, the higher the uncertainty in customer demand, the more important it is that parts of the supply chain will be managed based on a Pull strategy. In contrast, the higher the delivery cost relative to the unit price, the more important it is that part of the supply chain will be managed based on a Push strategy.

Figure 4-2 provides a clear frame to match products and industries. The vertical coordinate provides information on demand uncertainty while the horizontal coordinate presents relative delivery cost to the unit price. The region is divided into four areas. The area I represents products that are characterized by high demand uncertainty and low relative delivery cost, e.g. the computer manufacturer. Part of their supply chain will be based on a Pull strategy. The area III represents products that are characterized by low demand uncertainty and high delivery costs, such as daily grocery. In this case, a Pull strategy seems not appropriate while a Push strategy will achieve better result, since managing inventory based on long-term

forecast does not increase inventory holding costs and delivery costs are reduced due to economies of scale.

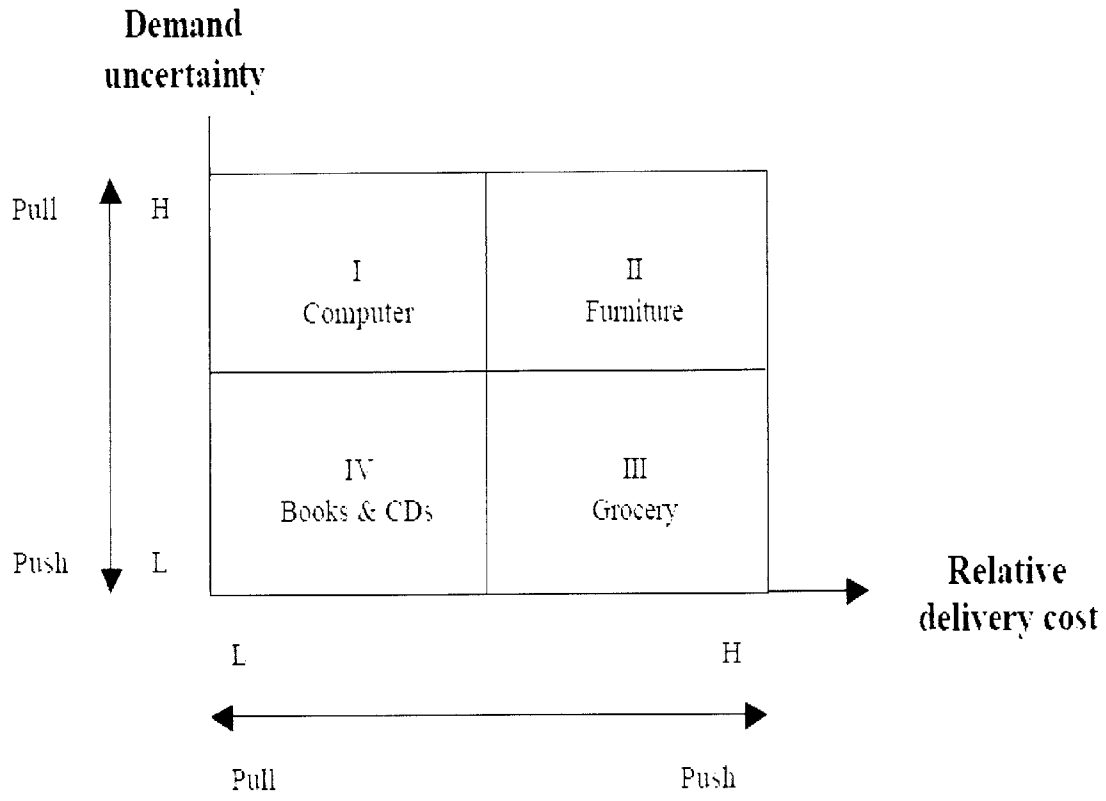

Figure 4-2 Supply Chain Strategies in different industry

(Source: Designing and Managing the Supply Chain, Simichi-Levi, McGraw-Hill)

Comparing with Area I and III, the remaining Areas II and IV are not straightforward since both are mismatch between the strategies suggested by the two attributes, demand uncertainty and relative delivery cost. In another word, in these areas demand uncertainty suggests the supply chain strategy to one way while delivery cost suggests a completely different way. For example, the Area IV represents products characterized by low demand uncertainty indicating

a Push supply chain, and low delivery costs suggesting a Pull system. Some typical products in this category are books and CD. Therefore, identifying the appropriate supply chain strategy is depending on the specific cost and demand uncertainties of both online and traditional retail.

Finally, Area II represents products with high demand uncertainty and high delivery costs. The furniture industry is an excellent example of this situation. A typical furniture retailer offers a large number of similar products distinguished by shape, color, fabric, etc. And as a result the corresponding uncertainty is very high. However, the delivery costs are very high as well. In this case, there is a need to distinguish between the production and distribution strategy. The production strategy has to follow a Pull-based strategy because it is impossible to make production decisions based on long-term forecasts. On the other side, the distribution strategy needs to take advantage of economies of scale and thus use retail channels. When a customer make an order, the order is sent to the manufacturer who orders raw materials to start producing based on order. Once the product is ready, it is shipped typically using truckload carriers, together with many other products to the retail store and from there to the customer. Therefore, the manufacturer usually has a fixed delivery schedule and this is used to aggregate all products that are delivery to stores in the same region. Once the new furniture arrives at the store, it can be inspected and repaired if needed. This distribution strategy allows the supply chain to reduce transportation costs and return rates. In some sense, this is a Pull-Push strategy since production is conducted based on realized demand (Pull strategy) while delivery is based on a fixed schedule which is a Push strategy.

In addition, the automobile industry also belongs to Area II. A typical car manufacturer offers a large number of similar products distinguished by functionality, motor power, shape, color, number of doors, sports wheels, etc. and as a result demand uncertainty for configuration is very high. Delivery costs are quite high as well. Traditionally, this industry applied a Push-based supply chain strategy, building inventory for dealer distribution systems. However, now some automobile manufacturers such as GM and Ford allow customers to do customization, which switched the traditional Push-based strategy to Push-Pull Strategy.

Obviously, there are many ways to implement a Push-Pull strategy, depending on the firm is locating the Push-Pull Boundary in its supply chain. To better understand this issue, *Supply Chain Time Line* is defined as the time that starts from procurement of raw materials to the delivery of an order to the customer. The Push-Pull boundary is located somewhere along the time line and it indicates the point in time where the firm switches from one strategy to a different strategy.

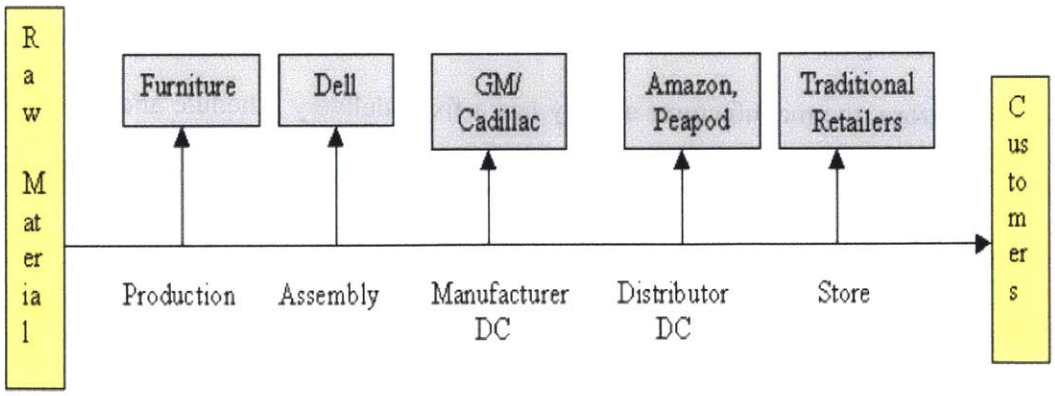

Figure 4-3 Potential Locations for the Push-Pull Boundary

(Source: Designing and Managing the Supply Chain, Simichi-Levi, McGraw-Hill)

Figure 4-3 presents some potential locations for the Push-Pull boundary together with industries that implemented the boundary at the various locations. For example, furniture manufacturers locate the boundary at the production point while Amazon.com locates the boundary at their distribution centers. There is also evident that as products move along the supply chain time line, their value increases. This implies that it is better to keep inventory in earlier stages of the supply chain rather than in later stages, since the cost of holding one unit inventory increases as the unit moves in the supply chain. However, in a Push-Pull strategy, the closer the boundary to the beginning of the supply chain time line, the longer the delivery lead time. Therefore, locating the boundary at production time as is done by furniture is not appropriate for products with lone assembly or transportation lead-times. In this case, it is better to move the boundary toward the end of the supply chain time line.

Chapter 5: Integration of E-business and ISCM

This section is further discussing the issues that happen during the delivery and integration of E-business and International Supply Chain Management.

5.1 Balancing Conflicting Objectives

For companies struggling to improve supply chain performance, the challenge is clear. They need to identify supply chain strategies that allow the enterprise to decrease system wide costs and increase service levels. Unfortunately, these are sometimes conflicting objectives. Indeed, high service levels require building inventory that is indirect conflict with the objective of reducing system wide cost. By contrast, a focus on cost reduction in the supply chain forces the firm to reduce inventory and lead to low service levels.

However, the Push-Pull strategy allows the supply chain partners to achieve both objectives. For example, the Push part of the supply chain is applied to the portion of the supply chain where long-term forecasts have small uncertainty and variability. Thus, service level is not a big challenge and the focus is on cost reduction. On the other hand, the Pull part is applied to the portion of the supply chain where uncertainty and variability are high. In this way, the focus of the pull part is on matching supply and demand.

Of course, even though the focus in the Pull portion of the supply chain strategy is on service level, the cost, especially the delivery cost, is an important issue since finally someone needs

to pay the cost. Amazon.com and Dell Computers transfer the entire cost to the customers. However, online grocers cannot transfer this cost in its entirety to the customers since they cannot rely on parcel services and have to develop their own distribution system. This industry cannot easily have the density of customers that will allow them to reduce delivery cost to an acceptable level. This disadvantage in this industry also opens a new door to a new type of home grocer or street grocer, that functions as online window for retailers, picks the produce at the store, and allows the customer to either pick up the goods at the store or pay for the home delivery, thus transferring the delivery problem and cost to the customer. This new model could be more cost-efficient and profitable than the full-delivery models.

5.2 Structuring the Scope of Collaboration

For companies needing to develop supply chain with other partners, determining the scope of trading partner collaboration is very important. Companies need to decide what will be the scope of the firm's processes and activities and correspondingly, what will be the level of collaboration with trading partners necessary to supply missing resources and competencies. Today, everyone accepts the idea that a company cannot and should not try to do everything and the collaboration with supply network partners, suppliers and customers is a necessity. But while the idea of collaboration is not new, drafting a collaboration agenda has become, in today's marketplace, a complex affair. Similar to other management concepts such JIT and TQM, most of the ambiguity stems from the fact that collaboration is a multi-faceted philosophy of business that can be approached from several angles. Simple forms of

collaboration occur when companies exchange information periodically. In contrast, collaboration can take the form of highly integrated, Web-enabled intermediaries, which focus on the real-time transfer of information and complex multiyear product development and marketing projects.

5.3 Ensuring Effective Resource Management

For modern companies, the effective application of its assets and management of its internal and supply chain infrastructures are the drivers of growth and profits. Part of the role of plans in the segment of E-business and supply chain strategy is to reengineer all business processes that are inefficient, and to rigorously eliminate all non value-added activities. Cost containment and optimization, however, is only part of this issue. Of far greater importance is the capacity to continuously reconfigure the resources found both within the organization and outside in the supply channel, in the pursuit of order-of-magnitude profit growth and competitive advantage. The ultimate goal is to construct business architectures that offer customers what they want: convenience in ordering, solutions to complex needs that often require "killer" service to be encapsulated with the product, speed of delivery, and ease of payment.

5.4 Pursuing Growth Management

Perhaps one of the most important components of e-supply chain management strategy integration is structuring a set of meaningful and focused performance measurements that will allow corporate planners to gauge the effectiveness of their supply chain solutions. Being able to determine the impact of a business strategy on profits and growth has always formed the only real cornerstone of competitive measurement, but with the advent of Internet technologies, the requirements for clear focus on supply chain direction and targeted metrics has never been more important. No company today would reject the principle that supply chain trading partners provide the potential for enormous competitive advantage and that exploring ways to gain greater connectivity and synchronization with the supply network is critical. However, determining just what the depth of partnership and the degree of integration should be requires a well-formulated plan and significant on-going analysis

5.5 Earning Consistent Trust

Trust has long been the cornerstone of any successful business relationship. Before the Internet, face-to-face communication typically formed the basis for long-lasting and profitable ventures, instilling confidence in both parties. In fact, recent studies show that face-to-face interaction promotes the greatest trust, followed by the telephone, then text chat, and last, e-mail. But with the explosion of E-business, trust can no longer be built on a handshake. We are now expected to collaborate more and more with people we've likely never even met.

Companies that can leverage the power of E-business while addressing issues of identity, trust, performance management will win the race and maximize their business performance.

The Internet has created opportunities for seamless business collaboration between buyers and sellers as well as the collection of service companies that have comprised traditional supply chains. The new Internet model breaks down traditional boundaries between business partners, in essence making all participants in a business transaction part of an expensive extranet. In theory, these business partners will be able to easily and securely communicate and complete end-to-end transactions from within their respective companies streamlining communications, increasing the precision of forecasts, and driving costs out of day-to-day operations. What the supply chain management in the E-business era to date has failed to do is replace or improve the one fundamental attribute required to conduct business: Trust.

Chapter 6: Future Opportunities

The previous chapters have identified an emerging business model, the Push-Pull strategy, driven by the Internet and allowing companies to increase supply chain performance. This business model requires a much closer relationship among supply chain participants and therefore calls for new practices and new modes of operation. Also the previous chapters discussed the issues for delivery and integration of E-supply chain management under global environment. Based on the understanding from previous chapters, this section will review the different stage of the integration between E-business and supply chain, then describe a new business opportunity motivated by the Internet and the E-business model from international perspective, finally present case analysis based on the new business model.

6.1 E-business and Supply Chain Integration Stage Review

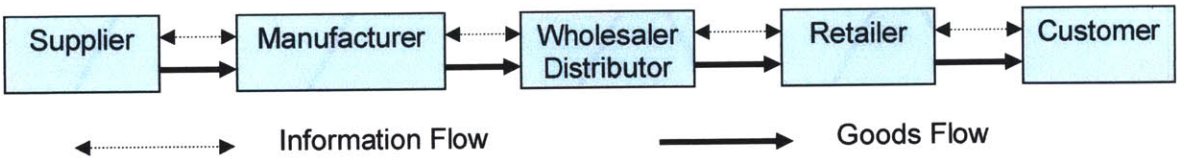

Figure 6-1 Single Supply Chain Branch

As mentioned in Chapter 1, in a typical supply chain environment (Figure 6-1), the physical goods flow from suppliers to manufacturers, manufacturers to wholesalers, wholesalers to retailers, and retailers to customers. At the same time, the information flows along the supply chain and those information flows are bi-directional since much information exchange

involves the interaction back and forth among the components along the supply chain. This typical single supply chain exists within one country before the advent of supply chain globalization.

As international trade became feasible and popular in the second stage, the entities along the supply chain within one country started extending supply chain into other countries. The primary strives for the international expansion of supply chains were exploring new markets and reducing production cost. Figure 6-2 illustrates the typical interacting relationship of two supply chains in two different countries.

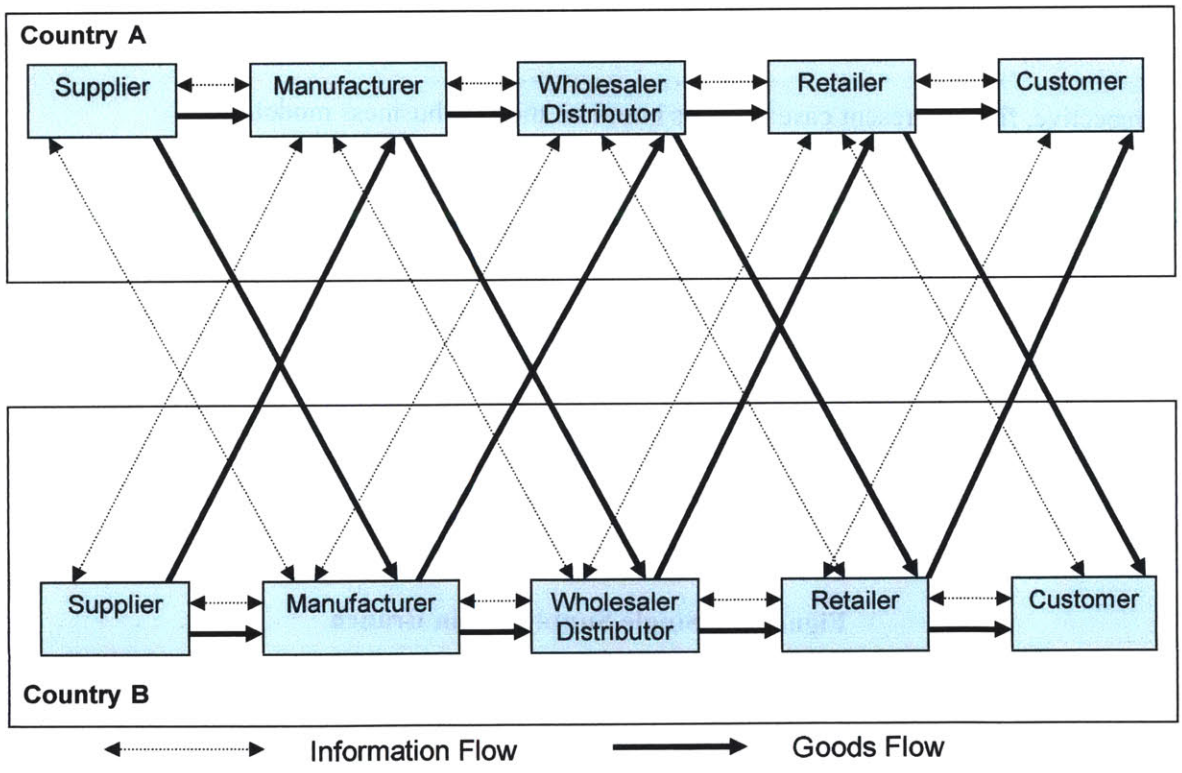

Figure 6-2 International Supply Chain within Two Countries

In the third stage, the advent of the Internet created the opportunities of E-business along the supply chain. E-business transformed the traditional supply chain into the new supply chain which is using web-based systems to reach the end customers. The United States was the first country which developed and used the Internet, and also the first country to initiate domestic E-business in 1990s, such as Domestic Business-to-Business (DB2B), Domestic Business-to-Customer (DB2C), and Domestic Customer-to-Customer (DC2C). Figure 6-3 shows the information and goods flow relationships between traditional supply chain and new E-business model within one country.

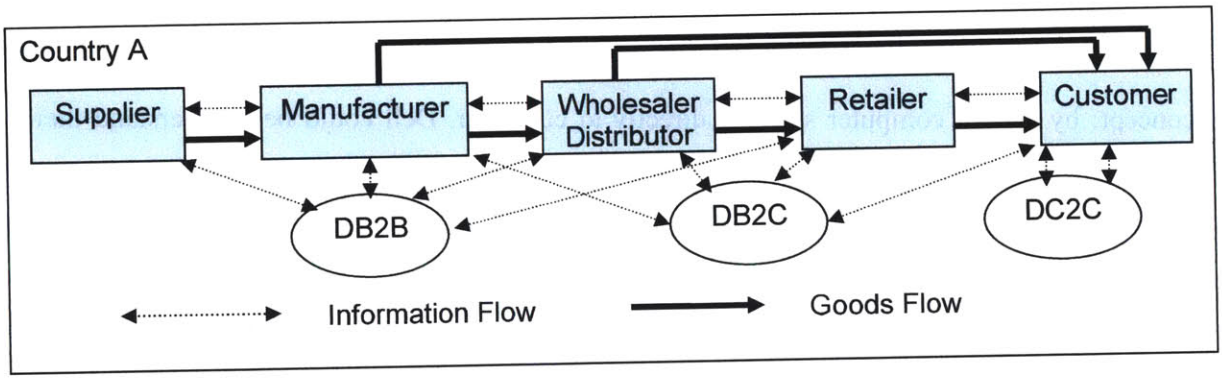

Figure 6-3 Integration of Supply Chain and E-business within One Country

There are some very successfully industry examples in these new models. In DC2C model (Figure 6-4), a very good example is eBay.com, which serves as electronic marketplace for the sales of goods and services among individual customers and small businesses. It was founded by Pierre Omidyar in 1995 when he sat down over a long holiday weekend to write the original computer code for what eventually became an Internet brand. Currently more than 100 million people in United States use eBay.com to buy and sell all manner of things to each other.

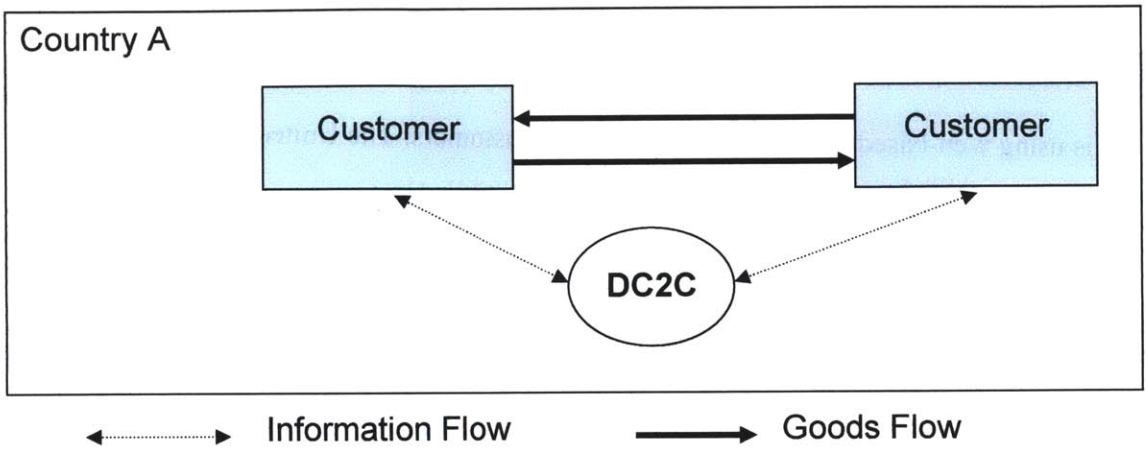

Figure 6-4 Domestic Customer-to-Customer (DC2C) Model

In DB2C model (Figure 6-5), Dell.com is a perfect example for direct-sale between PC manufacturer and customer. Dell was founded by Michael Dell in 1984 and based on a simple concept: by selling computer systems directly to customer, Dell could best understand their needs and efficiently provide the most effective computing solution to meet those needs. Dell.com is the E-business site that allows customer to directly customize product and place order via Internet. This model allows Dell to build every system to order and offer customers powerful, richly-configured systems at competitive prices.

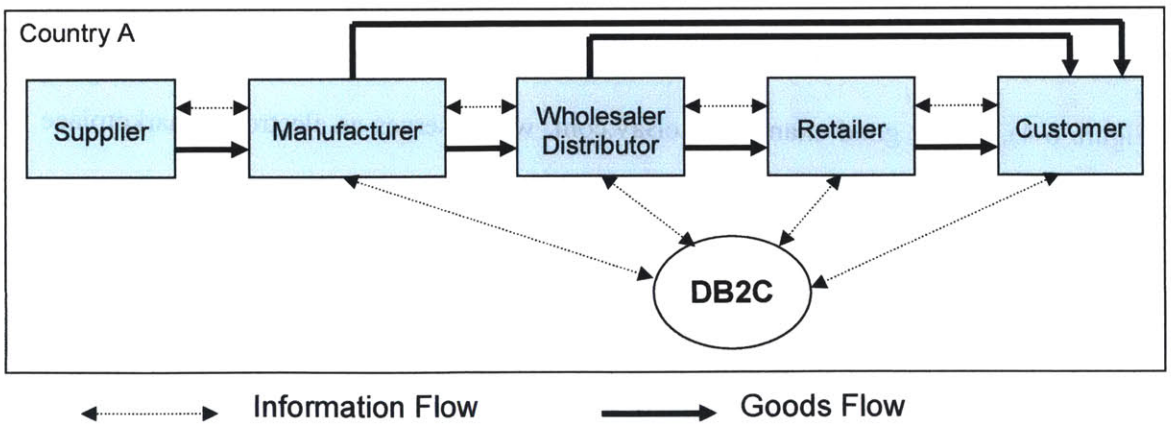

Figure 6-5 Domestic Business-to-Customer (DB2C) Model

In addition, Internet retail store is another popular form in DB2C model. Amazon.com is the role model for online retail stores. It started in 1994, was considered as the largest bookstore on the earth and now it is growing to be the largest online store. It primarily offers millions of books, DVDs, CDs, videos, toys, and electronics to customer through Amazon.com.

In DB2B model (Figure 6-6), besides the E-business providing collaboration service between two or several business, Liqidation.com is a more general online platform providing business-to-business transaction support service, and currently completes about 14,000 sale transactions monthly. Its network of buyers and sellers source and sell bulk inventory in a wide range of categories, including computers, networking, electronics, industrial equipment, vehicles, clothing & accessories, jewelry, general merchandise, and many others.

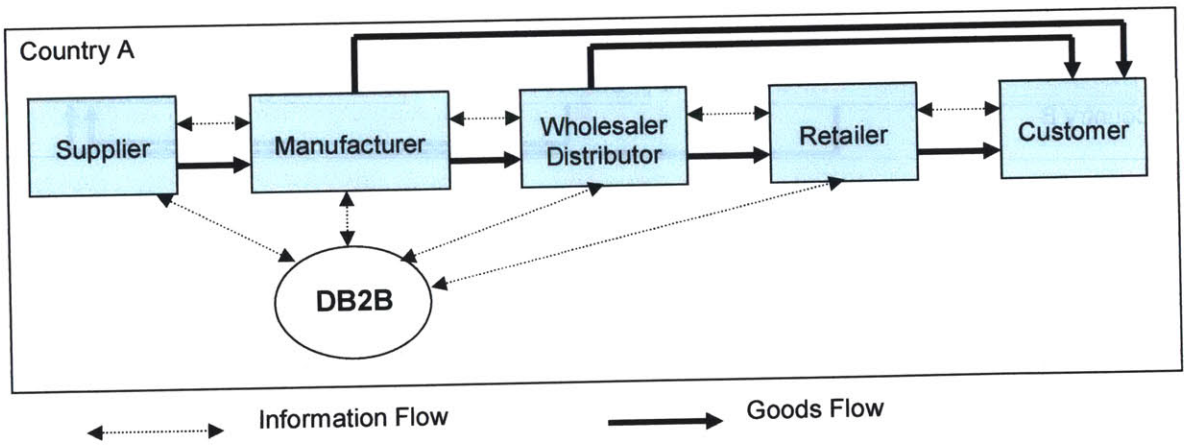

Figure 6-6 Domestic Business-to-Business (DB2B) Model

From the end of 1990s to present, the fourth stage (or current stage) of E-business and supply chain models has evolved. The major change is the globalization of E-business. All of the domestic E-business models in previous stages became global E-business very quickly due to

the dramatic growth of internet use. Figure 6-7 shows the basic international E-business model integrated with the supply chains within two countries.

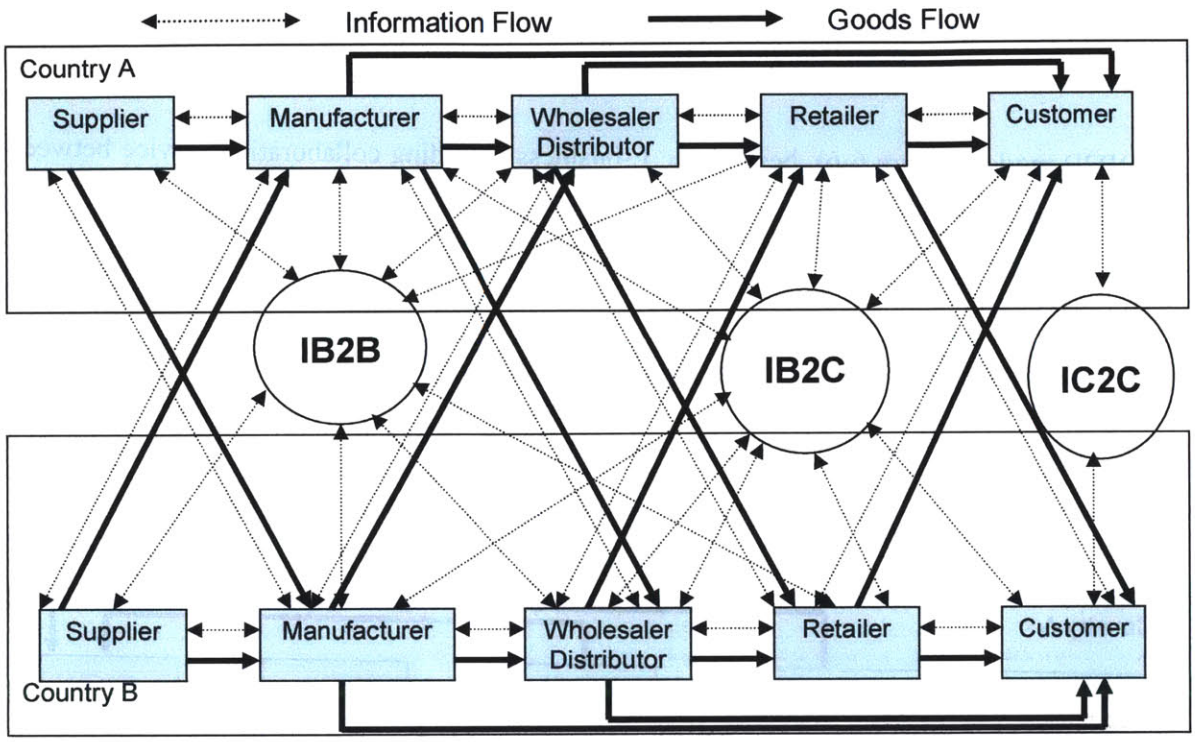

Figure 6-7 Integration of Supply Chain and E-business within Two Countries

The International Business-to-Business (IB2B) Model has become very successful. Alibaba.com is one perfect example. It was founded in 1999 and is based in Hangzhou, Eastern China. As a China's leading e-commerce company, Alibaba.com is the world's largest online marketplace for both international and domestic trade in China. It is the only import-export marketplace named "Best of the Web" six years in a row by Forbes magazine. The site has also been selected as a "Top Website for Entrepreneurs" by US-based Entrepreneur magazine and the most popular B2B website by readers of the Far Eastern Economic Review,

a leading financial magazine published by Dow Jones in Asia.[6] The main features of Alibaba.com are offering free basic membership with limitation on uploading pictures and conducting online communication. The revenue of Alibaba comes primarily from the charge for premium membership, which has flexibility compared with the limitation on free basic membership. However, the business transaction is actually completed outside without Alibaba's participation.

The International Customer-to-Customer (IC2C) Model is also very successful; eBay is still standing on the top of the trend. It has expanded itself to the entire world by either launching its own website or acquiring similar e-business company on target country. Now eBay become the largest global C2C online marketplace. In the first quarter of 2006, eBay's marketplaces delivered more than $1 billion in revenue for the first time. The main features of eBay's globalization are free membership; eBay charges commission on actual online transactions that use eBay's guidance.

Similarly, the International Business-to-Customer (IB2C) model, which uses internet to reach international market, is also giving manufacturers, wholesale distributors, and retailers a new opportunity to reach customers in other countries directly. However, there are still many disadvantages in this kind of models:

- International shipping cost is too high on individual shipment delivery.
- Delivery lead time is too long and customer service level is low.

[6] Source: Alibaba.com

- Due to culture differences and language barriers, there are always some difficulties to achieve good customer support without launching local facilities.

Therefore, in order to apply the B2C E-business model to reach international customers, large manufacturers (such as Dell, IBM) always locate a warehouse or distribution center in the target country to provide local customer support and other maintenance services. However, for small-size or medium-size business, it is not always feasible to locate a warehouse in the target country due to large investments required. The best solution for small business to reach international customer is IB2B model, which is using the global B2B marketplace (e.g. alibaba.com) to make deal with the distributor or retailer in other countries. Figure 6-8 illustrates the comparison of large and small manufacturers in reaching international market.

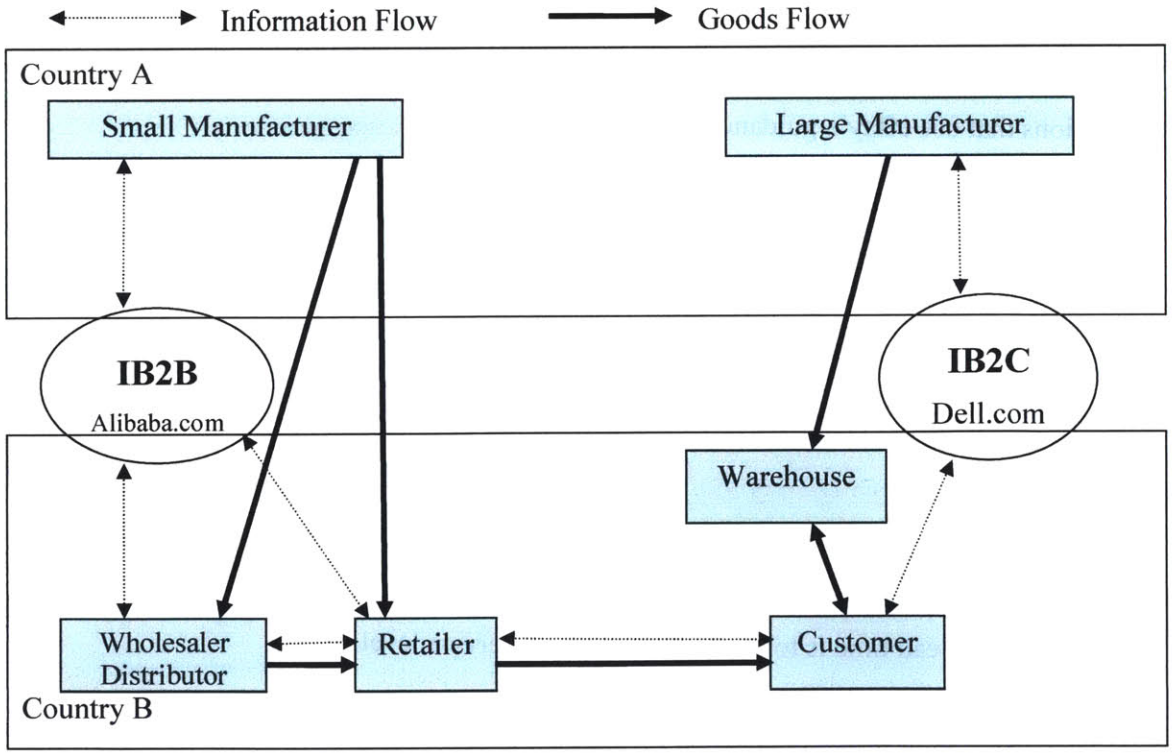

Figure 6-8 Comparison of Large and Small Manufacturers in reaching int'l market

The advantages of using IB2B for small businesses are:

- Bypass traditional import and export company
- Directly reach the wholesaler distributors and retailers in other countries
- Trading volume is relatively higher than IB2C
- Use international bulk transportation to reduce logistics cost

On the other side, using IB2B also has many disadvantages for small businesses:

- It is not possible to reach the end customer in target country.
- Profit margin is low, especially for low-tech product since profit must be shared with the wholesale distributor or retailer.

Therefore, there is one remaining question: Is there another better model for small business to reach international customers without sacrificing the profit margin?

6.2 Future Opportunity for Small Business to Reach International Customer

It is obvious that small businesses still do not have a model to implement B2C channels to reach international markets. Under E-business situations, most small businesses are using Global B2B marketplace to approach the international market as discussed above. From

Figure 6-8, we already identified that large manufacturers are directly launching their own warehouse or distribution center in the target country to fulfill customer orders. Therefore, for small business to reach international end customer, launching warehouses or distribution center in the target country is highly desirable to increase profit margin by directly fulfilling customer orders in the target country. However, due to the large investment required for distribution centers or associated support in other countries, this approach is generally not feasible for small business.

Considering the question in previous section again, "Is any other better model for small business to reach international customers without sacrificing the profit margin?" the key functions for the new model for small business should be:

- Approach international end customer directly, which is similar like one function of IB2C in Figure 6-8.
- Provide an internet marketplace for both small businesses and end customers, which could be a combination of IB2B and IB2C in Figure 6-8.
- Provide affordable logistics or warehouse support, which can fulfill customer order in target country, such as warehouse in Figure 6-8.

Based on above speculations and discussion, I proposed a new e-business model to provide all above key functions for small business to approach international end customer -------- Small-Business-to-International-Customer (SB2IC). Basically SB2IC can be divided as two major components: Online System and Supply Chain Support System. Figure 6-9 illustrates the

basic relationships among SB2IC, small manufacturers in one country and customer in another country.

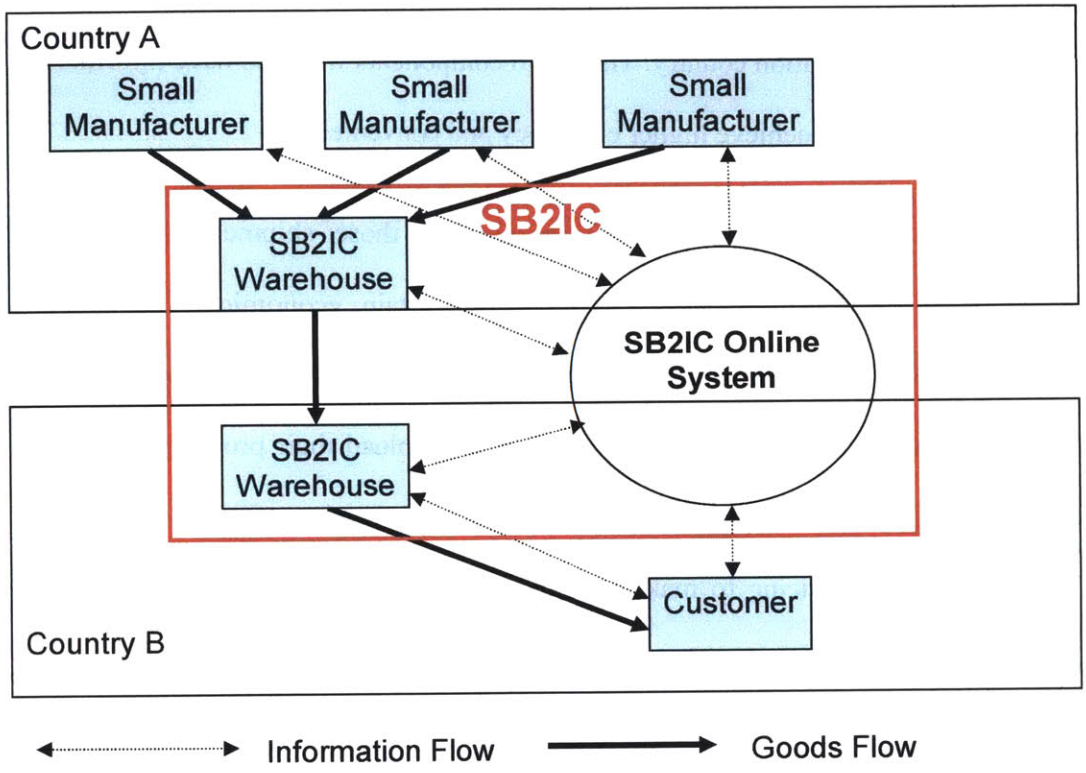

Figure 6-9 Small Business to International Customer (SB2IC) Model

The SB2IC Online System should be an Internet marketplace for small business to directly sell the product to the end customers in other countries. It typically allows small business to upload the product pictures and description and set the pricing for each product. Customers can make electronic payments on this online system. The other component, Supply Chain Support System, should be very similar to third party logistics providers, who provide global logistic support services, such as collecting shipments, combining individual LCL[7] shipments

[7] LCL means "Less than Container Load"

into FCL[8] shipments, arranging transportation between original country and destination country, warehousing storage, and local shipping to customer. In addition to these services by third party logistics providers, this component should also provide customer support service to the end customer in the destination country. These two components will also have information sharing between each other to achieve higher efficiency and convenience.

Typically, SB2IC Supply Chain System will accumulate those shipments from small businesses within a certain time, and ship them by certain economical international transportation (e.g. ocean container shipping) to the warehouse or distribution center in destination country. Meanwhile those small businesses can upload their product photos and descriptions to SB2IC Online System and set pricing for each product. SB2IC can provide some guidance on product pricing to make reasonable price. Once the customer places an order using the online system and makes the payment to SB2IC, the SB2IC will ship the product from distribution to customer immediately after receiving the payment. If the customer returns it to SB2IC under return policy within certain returnable period (e.g. two weeks), SB2IC will issue refund to the customer and restock the product to warehouse. If the product has not been returned, SB2IC will pass the majority of the profit to the small business with charging some commission.

The major benefits of this model are:

- Achieving economics of scale in international supply chain by aggregating individual demand of supply chain support together.

[8] FCL means "Full Container Load"

- Providing warehousing support to reduce lead time for small manufacturers.
- Providing customer support to increase service level for small manufacturers.
- Allows small businesses to directly sell their product to the end customer in other countries with affordable supply chain cost.
- By eliminating intermediaries, profits are much higher to small manufacturers comparing with current existing solution.

6.3 Case Analysis Regarding SB2IC Model

To be able to further illustrate the economic benefits, which SB2IC can bring the small manufacturer, this chapter will pick up one small manufacturer (Apex Electronic Watches & Clock Co. LTD.) in China as an example, and discuss its current situation and potential benefit with SB2IC model to reach U.S. market. The reasons for picking up Chinese small manufacturer are very obvious:

- China has become the largest country in the world that manufactures and export products to U.S., Canada and Europe.
- China has relatively more competitive advantages in manufacturing than any other country, such as very low labor rates, a skilled work force, established industrial infrastructure, stable economies, substantial export experience, plentiful natural resources (except oil), manufacturer-friendly governmental policies and foreign investment friendly government.

- "China Price" in manufacture has become the benchmark in the world.
- Many small Chinese manufacturers are anxiously looking for good opportunities to reach international customers by themselves.

Background about Apex Electronic Watch & Clock Co. LTD (APEX)

APEX, founded at Quanzhou China in 1992, is a professional company producing quartz cuckoo clocks, quartz cuckoo clock movement, table clocks, and wall clock. The products are sold to various countries and enjoy a very high international reputation. Its factory, located at Quanzhou City, covering more than 13,000 Square Meters, with more than 300 skilled workers. It always insists on the managing idea of "Keep Improving and Creating" and Quality Come First and Credibility Comes First" to offer the up-to-date products with best quality and customer service to every customer from all over the world.

APEX Current Situation to Approach U.S. Market

Currently APEX is using a traditional import-export company or global B2B marketplace (e.g. alibaba.com) to approach the U.S. market. Typically, APEX will offer FOB price on Xiamen[9] to the wholesalers or retailers in U.S., and the international freight and customer clearance will be responsible by U.S. wholesalers or retailers. And under this situation, their average profit on exported product is about 20% to the FOB price.

Gross Margin Analysis Methodology

[9] Xiamen, the closet international port for APEX factory, offers direct ocean and air transportation to U.S.

In order to have a good comparison of the result of clock sale in typical situations, we consider the following three typical models:

- IB2B Model: APEX sells product to U.S. wholesaler by using FOB Xiamen price term
- IB2C Model: APEX directly sells product to U.S. end customer by using global B2C marketplace, such as eBay.com, and ship each product individually to different customer by international express shipping, e.g. UPS.
- SB2IC Model: APEX directly sells product to U.S. end customer by using SB2IC online system and supply chain support system.

The methodology for this analysis is to compare the gross margin from the same quantities sales of the clocks by using each model. And also calculate the gross margin of SB2IC system and the break-even point among the quantity of the clock sale.

Assumption for Gross Margin Analysis

1. Assume the SB2IC online system is maintained by Yahoo professional solution, which charges monthly $300 hosting fee and 0.75% transaction fee based on sale.
2. Assume the SB2IC supply chain support system is handling by 3PL provider (e.g. shipwire.com), which typically charges monthly fee $79.95 and shipping & handling fee $1.50 per order.
3. Assume SB2IC system charge 30% commission based on final sales; initial set-up cost is not included into the gross margin analysis.

4. Use the typical hand-curved big-size cuckoo clock, which is the most popular product in U.S. market, as a sample product to explore its monthly gross margin in different kinds of situation including new SB2IC model. The basic data from APEX regarding this product is listed in the following table.

Sample Product (Big Size Cuckoo Clock)	
FOB Xiamen Price Per Unit (USD)	$ 20.00
Production Cost Per Unit (USD)	$ 16.00
Unit Package Length (meter)	0.530
Unit Package Width (meter)	0.420
Unit Package Height (meter)	0.180
Unit Volume (m^3)	0.040
Unit Package Weight (Kg)	3

Table 6-1 Sample Product Basic Data

5. Individual international express shipping fee for the clock from China to U.S. is based on UPS online calculation by its weight, volume, value, shipping location (Quanzhou, China 362000) and destination (Cambridge, MA 02139). The result from UPS.COM, $72.62, is used in current calculation.

6. Ocean shipping from China to U.S. is assumed to be from Xiamen, China to Los Angeles, CA by using only standard 20 ft container. The corresponding partial container (LCL) rate is $55.00 USD/$m^3$. The corresponding full 20ft container rate is $1750.00.[10] The 20 ft container loaded volume is assumed to 28 m^3.[11] The other ocean

[10] Regarding the ocean shipping rate, please refer to http://www.builderdepot.net/shipping.asp
[11] http://www.export911.com/e911/ship/dimen.htm

shipping associate fee such as forwarder fee, customer clearance fee will be based on the record of a typical shipment cost from APEX.

7. U.S. domestic shipping fee for the clock is also based on UPS online calculation by its weight, volume, value, shipping location (Los Angeles, CA) and destination (Cambridge, MA). The result from UPS.COM, $11.15, is using in current calculation.

8. After investigating the JcPenney.com and eBay.com, the U.S. online market price (including domestic shipping) for the clock is assumed to be $99.00. However, the actual in-store retail price will be much higher, range from $120 to $250.

9. The currency exchange rate from RMB to USD is assumed to be 8.00.

10. The U.S. Duty rate for the cuckoo clock is assumed to be 4.60%[12].

The results for the clock sales

IB2B Model: Selling to U.S. Wholesaler by FOB Xiamen (Monthly)	
Monthly Sales to Wholesaler (USD)	$ 1,000.00
Monthly Production Cost (USD)	$ 800.00
Total Cost of Goods Sold (USD)	**$ 800.00**
COGS to Sale (%)	80%
Gross Margin (USD)	**$ 200.00**
Gross Margin to Sale (%)	20%

Table 6-2 IB2B Model Result (50 Units' Sale)

[12] Please refer to http://www.usitc.gov/tata/hts/bychapter/index.htm

IB2C Model: Selling directly to Customer by Int'l individual Shipping (Monthly)	
Monthly Sales to Customer (USD)	$4,950.00
Monthly Production Cost (USD)	$ 800.00
Monthly China to U.S. Shipping Fee (USD)	$3,631.00
Total Cost of Goods Sold (USD)	**$4,431.00**
COGS to Sale (%)	89.52%
Gross Margin (USD)	**$ 519.00**
Gross Margin to Sale (%)	10.48%

Table 6-3 IB2C Model Result (50 Units' Sale)

SB2IC Model: Selling directly to Customer by Using SB2IC (Monthly)	
Monthly Sales (USD)	$ 4,950.00
Monthly Production Cost (USD)	$ 800.00
SB2IC Commission Fee: 30% to Sales (USD)	$ 1,485.00
Total Cost of Goods Sold (USD)	**$ 2,285.00**
COGS to Sale (%)	46.16%
Gross Margin (USD)	**$ 2,665.00**
Gross Margin to Sale (%)	53.84%

Table 6-4 SB2IC Model Result (50 Units' Sale)

From above results regarding 50 units' sales, it is very obvious that the gross margins have been increased by about 160% from $200 to $519 due to the change from IB2B model to IB2C model. And the change from IB2C model to SB2IC model is expected to achieve another 413% significant increase for gross margin from $519 to $2665. Comparing the IB2B model and SB2IC model, the gross margin has been increased about 12 times more. However, the SB2IC system is not profitable under current 50 units' sales since its gross margin is only about -$273 (Table 6-5), which means loss under monthly $1485 revenue.

SB2IC System Monthly Cost (Assume handling 20 ft container cargo)	
Monthly Revenue from the Commission Fee in Table 6-4 (USD)	**$1,485.00**
China Export Commodity Examination Fee (USD)	$ 75.00
China Export Sale Invoice Fee (USD)	$ 43.75
China Forwarder Associated Fee + Custom Clearance Fee (USD)	$ 37.50
Ocean Freight Cost From Xiamen to LA (USD)	$ 110.19
Duty Rate (=Duty Rate X Average Monthly Export Quan. X FOB Xiamen Price) (USD)	$ 46.00
U.S. Forwarder Associated Fee + Custom Clearance Fee (USD)	$ 155.00
U.S. Import Forklift Fee (USD)	$ 35.00
U.S. Import Traffic Mitigation Fee (USD)	$ 6.00
Delivery Cost to U.S. Warehouse (USD)	$ 200.00
U.S. Domestic Shipping Fee to End Customer (USD)	$ 557.50
Total Logistics Cost (USD)	**$1,265.94**
Logistics Cost to Revenue (%)	85.25%
Online System Holding Cost (USD) (based on Yahoo Professional Solution)	$ 300.00
Online System Transaction Fee (USD) (based on Yahoo Professional Solution, 0.75%)	$ 37.13
Warehousing Fee (based on shipwire.com)	$ 79.95
Shipping & Handling Fee (Based on Shipwire.com: $1.50 per order)	$ 75.00
Total Cost (USD)	**$1,758.01**
Logistics Cost to Revenue (%)	118.38%
Gross Margin (USD)	**$ (273.01)**
Gross Margin to Sale (%)	-18.38%

Table 6-5 SB2IC System Gross Margin Calculation (50 Units' Sale)

In order to have better understanding in comparing these three models, it is obvious that broad range of sale quantity should be studied. Therefore the results from 1 to 100 units' sale have been calculated. Figure 6-10 shows the gross margin curves among three models from 1 to 100 units of sales. It is very clear that the gross margin from the SB2IC model has been consistently over performed than the other two models. In addition, Figure 6-10 shows the

break-even point of SB2IC system gross margin is around 71 units, which means SB2IC will make profit if it can achieve at least 71 units' sales in one month.

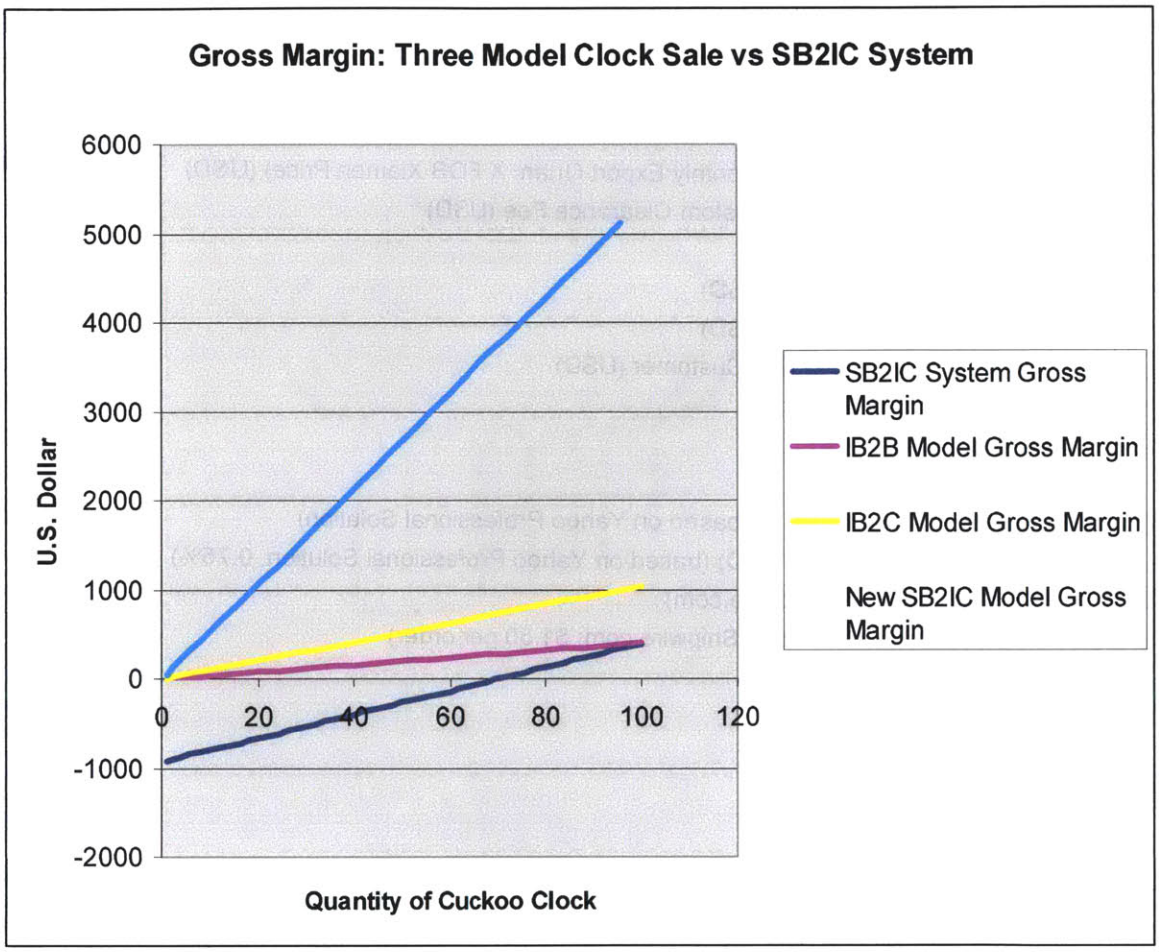

Figure 6-10 Gross Margin: Three Model Clock Sale vs. SB2IC System

Conclusion for Case Analysis

Under our assumptions, the case really shows significant increase in profit margin generating from SB2IC model for small clock manufacturer in China, comparing to direct sales to U.S.

wholesaler and end customer under IB2B model or IB2C model. From SB2IC system point of view, achieving profits is possible as long as the break-even point is reachable. According to APEX's record, it has exported more than 1,000 units of this clock to U.S. last year, which shows the current market demand in U.S. is already over the break-even point.

In practice, SB2IC system will be serving many products from small manufacturers. It definitely has the ability to adjust the product portfolio after certain time for the testing market. Therefore, after adjusting product portfolio, SB2IC system should be able to achieve the break-even point easier than the situation in current case.

Chapter 7: Conclusion

The Internet has created the opportunity to revolutionize old business models and particularly to implement new supply chain strategies. Indeed, the success of industry giants such as Dell Computers, Cisco and Amazon.com are primarily attributed to sophisticated Internet based international supply chain strategies.

In the mean time, the collapse of many dot.com companies also gave us an alert that E-business means great opportunities with great challenges. Since Internet is a global marketplace, how to identify the appropriate global supply chain strategy for a particular E-business is the key to those challenges. The new Push-Pull strategy combined the advantages of both Push and Pull strategy and reduce inventory while stilling responding customer demand.

Making an appropriate integration of global supply chain and E-business requires companies to keep the following principles in mind:

- Balancing conflicting objectives.
- Structuring the scope of collaboration.
- Ensuring effective resource management
- Pursuing growth management
- Earning consistent trust.

Even though the dot.com bubble burst, there are still some new opportunities provided by the Internet and global supply chain. The SB2IC has been identified as a better model for small business to reach international customer, for customer to enjoy low price, and also for SB2IC system itself to make reasonable profit. Therefore, it really achieves a three-win situation to successfully integrate international supply chain and E-business.

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